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PROBLEMS AND METHODS IN DIFFERENTIATING RACES OF PUCCINIA STRIIFORMIS IN
SELECTING WHEAT FOR RUST RESISTANCE

Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 82
(manuscript received 23 Jun 81) pp 92-96

ANPILOGOVA, L. K.

[Abstract] A study was made of genetic control of the trait of resistance of two biotypes of *Puccinia striiformis* in eight varieties of winter wheat (Suwon 92-Omar, Strubes Dickkopf, Spaldings Prolific, Carstens V, Reichersberg 42, Salzmuender Bartweizen, Ibis and Winnetou, using the F-2 hybrids obtained from simple, checking and diallelic crosses. Biotypes 20/92 and 31/99 were inoculated into the variety Stepnaya 135 used as the parental generation. Analysis of the findings showed that all tested varieties except Suwon 92-Omar contain the Yr2,3 gene; in addition, Carstens V and Ibis contain the Yr6 gene, Reichersberg 42 and Yr7, leaving open the question of resistance in Suwon 92-Omar, possibly dictated by a new gene (YrN). Backcrossing failed to select for homozygote resistance in individual gene families. Fungal heterogeneity and avirulence to the Yr and YrN genes was found using 14 F2 lines obtained from simple crossing, in genes nos. 2, 3, 6, 12 + 13, 11 + 14, 12 + 14, and 22 + 23. These varieties and lines can be used successfully as resistance donors in selecting wheat for immunity against *Puccina striiformis*. References 8: 7 Russian, 1 Western.

[373-9642]

UDC 615.285.7:547.241].074

ACCELERATED METHOD FOR DETERMINATION OF CHLOR- AND PHOSPHORORGANIC PESTICIDES

Moscow GIGIYENA I SANITARIYA in Russian № 10 Oct 82
(manuscript received 30 Mar 82) pp 58-61

[Article by V. I. Kurushkin and Yu. N. Bogoslovskiy, Moscow]

[Text] Today a great deal of attention in gas chromatography research is being directed at the reliability of identification of separate components, especially in cases of complex mixtures (M. C. Vigdergauz and coauthors). To accomplish this, most often parameters are defined for keeping the combinations being analyzed in two or more columns of different polarities and in different temperature conditions (M. S. Vigdergauz and coauthors; Erdey and coauthors).

Another way to increase the reliability of identification involves the application of several detectors with different specificities. The use of one even highly specific detector does not allow us to make a simple conclusion about the substance belonging to one group or another of chemical combinations, because the absolute quantity of the substance introduced is not known.

Usually gas chromatography models with one column are used, with several detectors connected to the column through a device that divides the flow of gases. The flaw in these models is the lack of assurance that after division in the column, the individual components will reach the detector. When two-staged gas chromatography models are used, with more powerful separating capacities and where the second stage has one or more parallel columns of different selectivity, it is possible to verify that the components of the mixtures being analyzed in the first stage have been separated completely.

When the number of columns in the second stage is increased, the reliability of proof of individuality of the identified component also increases. In practical work, however, sufficient reliability of identification is usually achieved using 1 or 2 columns in the second stage (Yu. N. Bogoslovskiy).

The most expedient method involves using two-staged models in which only that part of the mixture being analyzed which is of immediate interest is transferred into the column in the second stage; as a rule, this corresponds to one peak on the chromatogram from the column in the first stage, and the rest of the mixture is released into the atmosphere or is retained in the first stage column for subsequent analysis. In the second stage column a verification is made to see if this peak corresponds to one individual component or if it

consists of a mixture of components. If two or more peaks appear on the chromatogram for the second stage column, then a single peak on the chromatogram for the first stage column consists of several components. An individual component in the second stage columns cannot form more than one peak.

In the present study a two-staged gas chromatography model was used which was set up on the "Tsvet-106" chromatograph. The model consists of two filled columns of different selectivity, a switching device between them and a detection system. The first stage column was filled with a low-polarity phase SE-30 (5 percent) and the second stage column with mid-polarity XE-60 (5 percent) on the "G" AW-DMCS chromosorb with granulation of 80/100 mesh. Fractions from the first stage column were transferred into the second stage column using a pneumatic switching device made of glass. The model was made entirely of inert materials (glass and teflon) and is intended for analysis of chlororganic and phosphororganic combinations (pesticides).

The detection system consists of 3 ionization detectors: a flame-ionization detector that has a low selectivity in terms of organic combinations and 2 selective detectors--a thermo-ionic detector sensitive to phosphororganic combinations and a constant recombination speed detector sensitive to chlororganic combinations. The flame-ionization detector and the constant recombination speed detector are located at the exit of the first stage column and the thermo-ionic detector is located at the exit of the second stage column. Constant flows of the gas carrier reach the three detectors through the divider. The location of the detectors in the model is not of fundamental importance and depends only on the aim of the research. In order for all three detectors to operate in a linear range, it is necessary to use in gas chromatograph research concentrations of the substances to be analyzed that do not exceed 10^{-2} mg/ml.

As already noted, the sensitivity of the flame-ionization detector to all organic combinations being analyzed is approximately the same. The multiplicity of the change in the size of the detector's signal in relation to different classes of combinations is usually not greater than 10-20. The sensitivity of the thermo-ionic detector to phosphororganic combinations and of the constant recombination speed detector to chlororganic combinations is approximately 100-1000 times greater than that of the flame-ionization detector to the same combinations. The sensitivity of the thermo-ionic detector to chlororganic combinations and of the constant recombination speed detector to phosphororganic combinations is approximately 10-100 times greater than that of the flame-ionization detector. The absolute sensitivity of the constant recombination speed detector and the thermo-ionic detector to non-selective substances is approximately the same, but it is not higher than the sensitivity of the flame-ionization detector. In our case it is about 10^{-9} g.

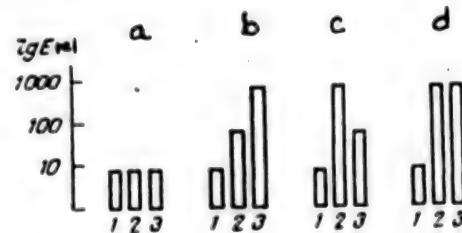
The relationship between the size of the signals obtained by combining the three detectors can serve as a basis for group identification when assigning the analyzed substance to the group of chlororganic or phosphororganic combinations, or it allows us to conclude that the given substance does not belong to either of these groups.

When measuring the detectors' signals, it is necessary to make corrections for the proportionality of the division of the flow of the gas carrier (the sample) between the detectors, as well as for weakening in the detector's signal in the measurement of small flows. Here we assume that the dimensions of the graduated scale of the automatic recording instruments are the same (in our case, the KSP-4 was used). Furthermore, in order to eliminate differences in the quantity of the substances in the samples, it is necessary to divide the signals of each detector by the size of the signal of the non-specific detector (the flame-ionization detector). Calculation of the relative value of the detectors' signals is done according to the following formula:

$$E_{\text{rel}} = \frac{a_1 \cdot x \cdot y_2}{x \cdot y \cdot a}$$

where E_{rel} is the relative value of a detector's signal; a is the measured value of the detector's signal; x is the proportion of the flow of the sample reaching the detector out of the entire sample flow introduced into the first stage column; y is the degree of weakening of the detector's signal in the IMT-05; 1 is the specific detector; and 2 is the non-specific detector. For convenience of comparison, the values of the detectors' signals can be expressed in logarithmic form, multiplied first by 10, so that $\lg E_{\text{rel}}$ (flame-ionization detector) = 1, and they can then be presented in graphic form (see the figure).

Diagram showing how the analyzed pesticides belong to the chlororganic combinations group or the phosphororganic combinations group, in relation to the size of the signals obtained from the 3 detectors. a - pesticide not belonging to either group; b - pesticide belonging to the chlororganic combinations group; c - pesticide belonging to the phosphororganic combinations group; d - pesticide belonging to both groups simultaneously. 1 - flame-ionization detector; 2 - thermo-ionic detector; 3 - constant recombination speed detector.



The sensitivity and specificity of these detectors can change during prolonged use, since in the process of the work they are contaminated by products of the thermal breakdown of the combinations being analyzed, and in the flame detectors this also depends on the amount of hydrogen coming in and, to a lesser degree, on the input of other gases. The sensitivity of the thermo-ionic detector also changes in connection with the evaporation of a tablet of cesium bromide. These errors can be avoided with the application of an external standard method.

If the signals from the three detectors are commensurate (the difference does not exceed an order of 1), we can assume that the component being analyzed does not belong to either group (see the figure, a). When the size of the signals obtained from the selective detectors, the thermo-ionic detector and the constant recombination speed detector, is greater than that of the flame-ionization detector (by an order of 1 or more), then a molecule of that component contains a heteroatom. If in addition to this the size of the signal from the constant recombination speed detector is greater than that of the thermo-ionic detector, then we can assume with a high degree of probability

that a molecule of the component being analyzed contains a halogen atom or a grouping of atoms with a strong affinity for the electron, and the given component belongs to the group of chlororganic combinations (see the figure, b). If the size of the signal from the constant recombination speed detector is smaller than that from the thermo-ionic detector, then we can confirm that a molecule of the analyzed component contains a phosphorous atom and the component belongs to the group of phosphororganic combinations (see the figure, c). If the signals from the constant recombination speed detector and the thermo-ionic detector are significantly greater than the flame-ionization detector's signal (by a factor of about 1000), and are approximately equal, then a molecule of the component being analyzed contains a phosphorous atom as well as a halogen atom, or a grouping of atoms with a strong affinity for the electron (see the figure, d).

It is possible to make individual identification and to determine whether the analyzed pesticides belong to one group by applying the relative values of the signals from the three detectors.

Using the model described, we studied the parameters of the retention of 22 chlororganic and phosphororganic combinations and we determined for them the relationships between the values of signals from the 3 detectors. The data are presented in tables 1 and 2.

The fundamental criterion for identification of pesticides is the set of parameters of their retention in 2 columns of different selectivity (SE-30 and XE-60), which are individual for each column and not totals. The total time of retention in 2 consecutive columns of different selectivity for some pesticides may be the same, while they are retained in separate columns for different periods of time. For example, keltan and heptachlor epoxide were retained in 2 columns for a total period of time that was almost the same, 19 min 30 sec and 19 min 21 sec, although the time spent in the separate columns differed substantially: keltan's set of retention time was 4 min 20 sec; 15 min 00 sec and heptachlor epoxide's set was 5 min 08 sec; 14 min 22 sec (in SE-30 and XE-60, respectively).

If the retention time for several pesticides coincides in one of the columns, then in the other, as a rule, the time is different; this makes it possible to identify the analyzed pesticide with sufficient reliability. For example, dieldrin and 4,4'-DDE have similar retention times in the SE-30 column: 7 min 55 sec and 8 min 00 sec, but in the XE-60 column the times are significantly different: 22 min 40 sec and 16 min 51 sec, respectively.

The relative values of the detectors' signals serve as additional criteria for identification, since they are less stable than the retention parameters; they do not however depend on them, which makes it possible to identify pesticides with the same retention parameters even in 2 columns. For example, pentachlornitrobenzol and 4,4 dichlorbiphenyl have the same retention time in 2 columns of the model, while the relative values of the detectors' signals for these pesticides differ significantly: for pentachlornitrobenzol they are lgE (thermo-ionic detector) = 3.01 and lgE (constant recombination speed detector) = 3.82 and for 4,4 dichlorbiphenyl they are lgE (thermo-ionic detector) = 1.70 and lgE (constant recombination speed detector) = 2.55; we can use the relative values of the detectors' signals to carry out the identification.

On the whole, identification of substances using the suggested model is carried out on the basis of the set of parameters of the retention of the substances in 2 columns of different selectivity, and in terms of the relative values of the signals from 3 detectors of different specificity. This provides more complete information concerning the nature of the substance being analyzed and also provides a higher degree of reliability in the identification.

Table 1 Retention parameters of the pesticides analyzed in the two-stage model with phases SE-30 and XE-60 ($t^0_{\text{fluctuation}} = 190^{\circ}\text{C}$)

Pesticide	SE-30		XE-60		Σ	
	t'_1	t_{rel}	t'_2	t_{rel}	$t'_1 + t'_2$	$t_{\text{rel}} \Sigma$
α -hexachlor-cyclohexane	1'35"	0.54	5'32"	0.26	7'07"	0.30
Hexachlorobenzene	1'40"	0.57	2'24"	0.11	4'04"	0.17
β -hexachlor-cyclohexane	1'44"	0.59	14'58"	0.71	16'42"	0.70
Phosphamidon	1'50"	0.63	21'40"	1.04	23'30"	0.98
γ -hexachlor-cyclohexane	1'57"	0.66	8'38"	0.41	10'35"	0.44
4,4'-PCB	2'05"	0.71	5'02"	0.24	7'07"	0.30
PCNB	2'07"	0.72	4'52"	0.23	6'59"	0.30
Octamethyl	2'21"	0.80	14'19"	0.68	16'40"	0.69
Diazinon	2'21"	0.80	4'51"	0.23	7'12"	0.30
Hexachlorcyclohexane	2'30"	0.85	14'59"	0.71	17'29"	0.73
Metaphos	2'56"	1.00	21'04"	1.00	24'00"	1.00
Heptachlor	3'15"	1.11	6'05"	0.29	9'20"	0.39
Trolene	3'21"	1.14	9'42"	0.46	13'03"	0.54
Methylnitrophos	3'25"	1.16	21'58"	1.04	25'23"	1.06
Methylethylthiophos	3'31"	1.20	22'32"	1.07	26'03"	1.09
Aldrin	3'55"	1.34	7'30"	0.36	11'25"	0.48
TCM-3	4'00"	1.36	10'15"	0.49	14'15"	0.58
Carbophos	4'05"	1.39	18'05"	0.86	22'10"	0.92
Parathion	4'12"	1.43	24'01"	1.14	28'13"	1.16
Kelthane	4'20"	1.48	15'00"	0.71	19'20"	0.81
Heptachlor	5'08"	1.75	14'22"	0.68	19'30"	0.81
Dieldrin	7'55"	2.70	22'40"	1.08	30'35"	1.27
4,4'-DDE	8'00"	2.73	16'51"	0.80	24'51"	1.04
4,4'-DDD	9'38"	3.28	44'41"	2.21	54'19"	2.26
4,4'-DDT	13'25"	4.57	40'23"	1.92	53'48"	2.24

Table 2 Relative values of the signals of three detectors for the analyzed pesticides ($M \pm m$)

<u>Pesticide</u>	<u>Flame-ionization detector</u>		<u>Constant re-combination speed detector</u>	<u>Thermo-ionic detector</u>			
	<u>E</u>	<u>lgE</u>	<u>E</u>	<u>lgE</u>	<u>E</u>	<u>lgE</u>	<u>ΔlgE</u>
α -hexachlor-cyclohexane	1	1	258.8 ± 2.9	3.41	44.6 ± 0.8	2.65	+0.76
Hexachlorobenzene	1	1	162.7 ± 1.5	3.21	16.1 ± 0.5	2.21	+1.00
β -hexachlor-cyclohexane	1	1	251.3 ± 2.9	3.40	42.2 ± 0.7	2.63	+0.77
Phosphamidon	1	1	200.1 ± 2.7	3.30	384.0 ± 4.1	3.58	-0.28
γ -hexachlor-cyclohexane	1	1	262.9 ± 2.8	3.42	46.4 ± 0.9	2.66	+0.76
4,4' PCB	1	1	35.0 ± 0.8	2.55	5.0 ± 0.1	1.70	+0.85
PCNB	1	1	668.0 ± 2.2	3.82	103.0 ± 1.3	3.01	+0.81
Octamethyl	1	1	101.2 ± 2.3	3.01	389.3 ± 3.2	3.59	-0.58
Diazinon	1	1	80.1 ± 1.4	2.90	165.5 ± 2.1	3.22	-0.32
Hexachlorcyclohexane	1	1	255.5 ± 2.0	3.41	45.1 ± 0.9	2.65	+0.76
Metaphos	1	1	140.5 ± 2.3	3.15	225.4 ± 2.8	3.35	-0.20
Heptachlor	1	1	78.8 ± 1.1	2.90	19.0 ± 0.7	2.28	+0.62
Trolene	1	1	789.1 ± 7.2	3.90	403.1 ± 5.4	3.61	+0.29
Metathion	1	1	110.5 ± 2.5	3.04	202.1 ± 4.1	3.30	-0.26
Methylethylthiophos	1	1	143.1 ± 2.1	3.16	231.1 ± 3.3	3.36	-0.20
Aldrin	1	1	129.8 ± 3.0	3.11	17.5 ± 0.5	2.24	+0.87
TCM-3	1	1	832.0 ± 9.1	3.92	450.0 ± 6.2	3.65	+0.27
Carbophos	1	1	58.3 ± 1.2	2.77	216.5 ± 3.3	3.34	-0.57
Parathion	1	1	139.1 ± 2.2	3.14	232.2 ± 3.5	3.37	-0.23
Kelthane	1	1	211.9 ± 4.0	3.33	9.9 ± 0.2	1.99	+1.34
Heptachlor	1	1	60.2 ± 1.3	2.78	6.2 ± 0.2	1.79	+0.99
Dieldrin	1	1	340.0 ± 3.1	3.53	19.5 ± 0.4	2.29	+1.24
4,4-DDE	1	1	263.2 ± 3.0	3.42	9.1 ± 0.2	1.96	+1.46
4,4-DDD	1	1	280.4 ± 3.1	3.45	7.3 ± 0.1	1.86	+1.59
4,4-DDT	1	1	299.8 ± 3.3	3.48	7.2 ± 0.1	1.86	+1.62

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RESEARCH ON THE PROTECTIVE EFFECTIVENESS OF THE FPP-15 FABRIC AGAINST
BACTERIAL AEROSOL

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 82
(manuscript received 27 Jan 82) pp 65-66

[Article by V. S. Bortkevich, I. A. Cherednichenko and A. G. Moroz, Belo-
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[Text] In microbiological and virological research on pathogenic agents laboratory personnel and the environment can become infected or contaminated. There are various pathways for infection of laboratory service personnel (Dawidson). Analyses of the infections conducted in the United States and England showed that the majority (about 80 percent) of the infections occur via the aerosol pathway, as a result of pathogenic microorganisms' contaminating the air (Dawidson; Phillips).

The danger of infection presents investigators with the task of developing defensive measures and means. The most reliable method for guaranteeing personal and public safety is the use of equipment that makes it possible to isolate the infectious material from the investigator and at the same time to exclude other pathways of infection (Phillips).

Since it is known that the aerosol pathway of infection is the one encountered most often, the problem arises of cleaning the air at the entrance and especially at the exit of the protective equipment of the biologically dangerous contamination that is formed. One way to solve this problem is filtration of the contaminated air through filters that are capable of providing a sufficiently high degree of elimination of all possible aerosols. In the USSR, FP fine-fiber filtration materials are used for this purpose (Petryanov filters); their application is the most convenient and economical (I. V. Petryanov).

When using the FP fabrics for protection against bacterial aerosols it is necessary to establish ahead of time the dependence of the escape coefficient on the height of the filtration layer and the speed of filtration, since an overestimation of the latter at the exit from the protective equipment can lead to partial or even complete escape of the infectious particles into the external environment.

Testing the protective effectiveness of the FPP-15 fabric was carried out on a stand, as depicted in figure 1. The model for a similar stand was used

in designing this stand (L. I. Dudina and V. L. Yevdokimov). For a test subject we used a culture of *Serratia marcescens*, strain no 560, obtained from the museum of the Minsk Medical Institute. The microbes were grown in a 2 percent protein-peptone agar; titration was done in Levin's medium.

We sprayed a suspension of the 21-22 hour microbe culture into a physiological solution containing 1 billion microbial bodies per 1 ml according to the standard of turbidity (GKIT). The spraying was done in a box-chamber type 2BP2-0S directly into the opening of the air channel where a cartridge containing a piece of the FPP-15 fabric (TU6-16-1342-69) was attached; the area of the fabric was 0.008 m^2 and it was taken from a LAIK filter. We used an AI-1 inhaler for the spraying, which provided an aerosol with particles up to 10 nm in size.

The filtration speeds for air passing through one layer of FPP-15 fabric were 0.01, 0.02, 0.03, 0.04 m/sec (through two layers, we used only 0.04 m/sec), and did not exceed the tolerance of the fabric. Calculations showed that a speed of 0.04 m/sec corresponded to the permissible work load (for 1 m^2 this is equal to $150 \text{ m}^3/\text{hr}$). For each filtration speed 5 bacter^a titration tests were done before and after filtration.

Using a "Krasnogvardeyets" electro-aspirator, we collected 100-liter samples of air which were then joined with a 10 ml sorbent physiological solution according to the method described in "Instructions for Working with Aerosols Containing Especially Dangerous and Other Bacterial Infectious Agents" ("Microbe" All-Union Scientific Research and Planning Institute). A count was made of the colonies of microbes that had grown after 16-18 hours of incubation at 37°C . The values for the different titers were calculated, proceeding from 3 parallel determinations of the number of colonies that had grown for each of the 2-4 sample cultures used. A simplified modification of the titration of the *S. marcescens* in paraffin holes was developed (V. D. Timakov and D. M. Gol'dfarb). Samples of the suspension in the original concentration of 500 million microbial bodies per 1 ml were placed simultaneously in Petri dishes (0.1 ml) and in the holes (0.01 ml), 3 samples per each culture. A calculation of the bacteria titer was done according to the generally accepted formulas and the significance of the differences was determined using the t-criterion (P. F. Rokitskiy).

The escape coefficient (C_{esc}) was determined by dividing the concentration of microbial bodies (multiplied first by 100) before filtration through the FPP-15 fabric by the value for the concentration after filtration. For convenience the number of viable bacteria in 1 ml of sorbent liquid was recalculated for 1 liter of collected air. The protective effectiveness (η) of the filtration material was determined according to the formula: $\eta = 100\% - \frac{C_{\text{esc}}}{C_{\text{esc}}}$.

We determined the correlation between the number of viable bacteria in 1 ml of sorbent liquid after passing through the FPP-15 fabric and the filtration speed, as well as the statistical significance of this correlation, on the basis of a linear regression, taking the separate titers of bacteria in the sample as one observation (V. Yu. Urbakh). The mean titers of bacteria were

calculated as the arithmetic means, and not as the geometric means, since in the process of the experiment the growth of the microbes themselves was not studied.

The results of the 5 comparative titrations of the *S. marcescens* cultures in the Petri dishes and the paraffin holes showed that the difference between the titers of bacteria in the dishes ($4.03 \cdot 10^8$ microbial bodies in 1 ml) and in the holes ($4.03 \cdot 10^8$ microbial bodies in 1 ml) was equal to zero, which means that the statistical significance is $P > 0.05$.

In determining the number of viable bacteria in 1 ml of sorbent liquid after passing through 1 layer of FPP-15 fabric with filtration speeds of 0.01-0.04 m/sec, we established that the lowest concentration in all the tests was observed at a filtration speed of 0.01 m/sec (table 1).

A comparison of the results of the data from the separate tests and of the mean values showed that an increase in speed (from 0.01 m/sec to 0.04 m/sec) leads to an increase in the number of bacterial particles (from 316 to 7593 microbial bodies in 1 ml) passing through the FPP-15 fabric.

The correlation between the concentration of bacteria passing through the FPP-15 fabric being tested, in 1 ml of sorbent liquid, and the filtration speed ($r = +0.95$) has a high degree of statistical significance. The linear regression of the correlation between the concentration of bacteria and the filtration speed ($x/y = 2.426 \cdot 10^5$) has the same statistical significance. This correlation, with its 95 percent confidence limits, is shown graphically in figure 2.

Apparently the linear regression correlation is not maintained with speeds less than 0.01 m/sec and it is difficult to draw any accurate conclusions about the point on the diagram at which the escape of bacterial particles ceases completely.

The values obtained using a regression equation ($Y = -2109.491 + 2425516.7 x$) for the concentration of bacteria after passing through the FPP-15 fabric and the escape coefficients that were determined on this basis for each of the filtration speeds studied (table 2) provide evidence of an increase in this coefficient from 0.01 to 0.28 percent and a decrease in the protective effectiveness of the fabric from 99.99 percent to 99.72 percent.

We found no escape of bacterial particles with filtration through 2 layers of FPP-15 fabric at a speed of 0.04 m/sec.

Thus, when evaluating the protective effectiveness of filtration materials, we consider the optimal filtration speed to be that at which there is no escape of infectious particles, that is, the speed at which there is maximum effectiveness. If we take into account the fact that in our tests we used a knowingly overestimated concentration of bacteria (before filtration) in 1 liter of air ($2.7 \cdot 10^4$ microbial bodies per 1 ml), we can consider the filtration speed of 0.01 m/sec, at which the greatest effectiveness of the FPP-15 fabric was observed (99.99 percent), to be optimal. With an increase in filtration there was an increase in the escape of bacterial particles and a decrease in the protective effectiveness.

The test-system that we studied for evaluating the protective effectiveness of filtration materials on a bacterial model for laboratories under intensified conditions still requires conclusive experimental testing with arenaviruses; this will be the subject of our future research.

Figure 1--Model of a stand for testing the protective effectiveness of filtration materials. 1 - electro-aspirator; 2 - detachable cartridge for attachment of filtration material; 3 - filtration material; 4 - sprayer; 5 - compressor; 6 - sample collection openings; 7 - air channels; 8 - protective hermetic boxes

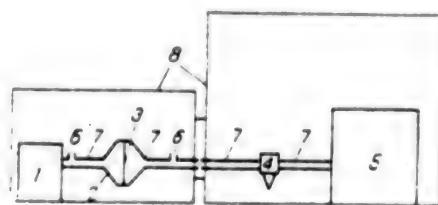


Figure 2--Regression correlation between the number of microbial bodies in 1 ml of sorbent liquid after passing through the filtration material and the filtration speed, with confidence limits of 95 percent (original concentration of bacteria in the suspension that was sprayed was $2.72 \cdot 10^6 \pm 0.37$ microbial bodies in 1 ml). a - regression correlation between the number of microbial bodies in the sorbent liquid after passing through the FPP-15 fabric and the filtration speed; b,c - upper and lower 95 percent confidence limits; the y-axis represents the number of microbial bodies in 1 ml of sorbent liquid after passing through the fabric being tested; the x-axis represents the speed of the air passing through the fabric (m/sec).

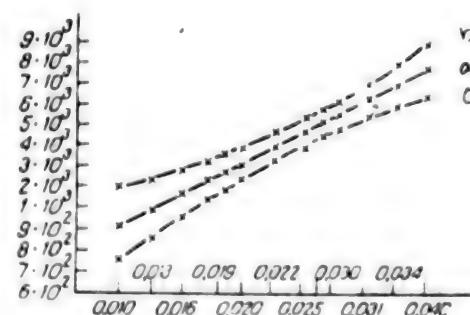


Table 1 Number of viable bacteria in 1 ml of sorbent liquid after passing through 1 layer of the FPP-15 fabric at different filtration speeds

Filtration speed (m/sec)	No of experiment					Mean number of bacteria (microbial bodies in 1 ml), calculated by comparison with the regression
	1	2	3	4	5	
	Concentration of bacteria number of microbial bodies in 1 ml					
0.01	0	667	0	0	333	316 ± 639
0.02	2333	3939	1818	3333	2727	2742 ± 402
0.03	3939	6364	3039	4805	5706	6167 ± 331
0.04	6667	10,210	5758	9301	7205	7593 ± 503

Before filtration $2.00 \cdot 10^6$ $3.78 \cdot 10^6$ $1.77 \cdot 10^6$ $3.03 \cdot 10^6$ $3.00 \cdot 10^6$ $2.72 \cdot 10^6 \pm 0.37^*$

*Mean arithmetic value

Table 2 Results of the determination of the escape coefficient and the protective effectiveness at different filtration speeds (mean data from 5 tests; $M \pm m$)

<u>Filtration speed (m/sec)</u>	Mean titer of bacteria in 1 liter of air, calculated by comparison with the regression, no of microbial bodies in 1 ml	<u>Mean escape coefficient (percent)</u>	<u>Mean protective effectiveness (percent)</u>
	<u>After filtration</u>	<u>Before Filtration</u>	
0.01	3.2 ± 6.4	$2.7 \cdot 10^4 \pm 0.37$	0.01 ± 0.02
0.02	27.4 ± 4.0	$2.7 \cdot 10^4 \pm 0.37$	0.10 ± 0.02
0.03	61.7 ± 3.3	$2.7 \cdot 10^4 \pm 0.37$	0.19 ± 0.03
0.04	75.9 ± 5.0	$2.7 \cdot 10^4 \pm 0.37$	0.28 ± 0.04

Note: The standard deviation (m) is calculated according to the formula presented in the work of V. Yu. Urbakh.

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DISTRIBUTION OF CHLORORGANIC PESTICIDES AND POLYCHLORINATED BIPHENYLS
AMONG SEVERAL ELEMENTS OF THE BALTIC SEA ECOSYSTEM

Moscow GIGIYENA I SANITARIYA in Russian No 10, Oct 82
(manuscript received 9 Apr 82) pp 67-68

[Article by O. O. Roots, Thermal Physics and Electrophysics Institute of
the EsSSR Academy of Sciences, Tallinn]

[Text] The first polychlorinated biphenyls (PCB's) were found in the Baltic Sea in 1966 (Jensen). In 1968, PCB's were the cause of serious illness in Japan in the districts of Nagasaki and Fukuoka. The toxicity of PCB's has not been studied adequately yet, even though cases have been described in which people have been poisoned, sometimes with fatal consequences.

The aim of the present work was to establish mean coefficients of the accumulation of chlororganic pesticides (COP's) and PCB's from the sea water in the food chain of the sea's marine life. The coefficients obtained can be used practically to predict the preliminary average content of chlororganic hydrocarbons in the Baltic ecosystem (by determining the concentration of chlororganic substances in the first of 3 links--in the sea water, plankton or fish; the other 2 can be calculated using the author's accumulation coefficients).

We also set as a goal determination of the regions of the sea where the accumulation coefficients were the highest..

Establishing general rules for accumulation of COP's and PCB's in the sea's marine life using the food chain of the sprat was complicated by the subspecies, population and geographical differences (for example, there is the gulf sprat and the sea sprat), as well as by the stratified nature of the daytime and nighttime gathering of the fish.

The unequal distribution of sprats during their active feeding period, and the age, subspecies and geographical differences made it difficult to establish general principles for the accumulation of COP's and PCB's in the fish in relation to age and population site. Therefore, we thought a more reliable method for studying the accumulation of toxins in the sea's marine life would be the use of accumulation coefficients calculated for the water and applied to the marine life.

We used the following formulas to establish the mean accumulation coefficients of total DDT and PCB's in the Baltic Sea ecosystem:

$$a_{wf} = K_f / K_w, \quad b_{wf} = K'_f / K'_w$$

$$a_{pf} = K_f / K_p, \quad b_{pf} = K'_f / K'_p$$

$$a_{wp} = K_p / K_w, \quad b_{wp} = K'_p / K'_w$$

The values for K_f , K'_f , K'_p , K_w , and K'_w were determined practically by the author for the Baltic Sea (O. Roots and E. Peikre, 1978; 1981).

K_f , K'_f are the concentrations of total DDT and PCB's in fish, in mg/kg wet weight, dependent on the age of the sprat.

K_w , K'_w are the concentrations of total DDT and PCB's in the water in the area that the sprat population inhabits, ng/liter.

K_p , K'_p are the concentrations of total DDT and PCB's in the zooplankton found in the area inhabited by the sprats, mg/kg wet weight.

a_{wp} , b_{wp} are the accumulation coefficients for total DDT and PCB's from the water to the zooplankton.

a_{wf} , b_{wf} are the accumulation coefficients for total DDT and PCB's from the sea water to the sprat muscle tissue, dependent on the age of the fish and the area it inhabits.

a_{pf} , b_{pf} are the accumulation coefficients for total DDT and PCB's from zooplankton to the sprat muscle tissue, dependent on the age of the fish and the area it inhabits.

The table shows the mean accumulation coefficients for DDT and PCB's from sea water to zooplankton and fish, as well as from zooplankton to sprats. The concentration of chlororganics in the sea water, according to the data from the analyses, did not depend substantially on the depth (below 5 m), therefore in calculating the accumulation coefficients for chlororganics from water to sprat we used the same chlororganic concentrations. The accumulation coefficients that we established for COP's and PCB's compare well with analogous indicators that have been obtained for marine life in other parts of the world's ocean.

The results of this research indicate that future study of the distribution of accumulations of DDT and PCB's in the Baltic Sea ecosystem should focus on the open parts of the sea where the accumulation coefficients are highest.

Mean accumulation coefficients for DDT and PCB's

Location of population	Age of fish (yrs)	Accumulation coefficient					
		a _{wp}	b _{wp}	a _{wf}	b _{wf}	a _{pf}	b _{pf}
Gulf of Finland, western part	2	14000	18000	138000	49000	9,7	2,8
	3	14000	18000	67000	45000	4,7	2,6
	4	14000	18000	157000	88000	11,0	5,0
	5	14000	18000	76000	43000	5,3	2,4
	6	14000	18000	76000	49000	5,3	2,8
	7	14000	18000	105000	73000	7,3	4,1
	10	21000	24000	63000	22000	3,0	0,9
eastern part	2	21000	24000	75000	17000	3,6	0,7
	3	21000	24000	71000	26000	3,4	1,1
	4	21000	24000	67000	38000	3,2	1,6
	5	21000	24000	71000	17000	3,4	0,7
	6	21000	24000	96000	17000	4,6	0,7
	7	21000	24000	125000	22000	6,0	0,9
	10	21000	24000	105000	15000	5,0	0,9
Gulf of Riga	3	21000	17000	100000	17000	4,8	1,0
	4	21000	17000	126000	26000	6,0	1,6
	5	21000	17000	105000	17000	5,0	1,0
	6	21000	17000	111000	29000	5,3	1,7
	7	21000	17000	137000	35000	6,5	2,1
	9	21000	17000				
Open area of Baltic Sea: from Ventspils to Sarema Islands	2	119000	23000	100000	43000	0,8	1,9
	3	119000	23000	44000	54000	0,4	2,3
	4	119000	23000	163000	48000	1,4	2,1
	5	119000	23000	206000	64000	1,7	2,8
	6	119000	23000	61000	88000	5,2	3,8
	7	119000	23000	369000	68000	3,1	2,9
	9	119000	23000	556000	173000	4,7	7,5
	10	119000	23000				
Northwest coast of Sarema Islands	2	85000	35000	120000	38000	1,1	1,2
	3	85000	35000	160000	45000	1,5	1,5
	4	85000	35000	260000	64000	2,4	2,1
	5	85000	35000	310000	90000	2,8	2,9
	6	85000	35000	550000	121000	5,0	3,9
	7	85000	35000	400000	83000	3,6	2,7
	8	85000	35000				
Coast from Liepaja to Klaipeda	1	111000	31000	92000	38000	1,1	1,1
	2	111000	31000	246000	66000	2,9	1,9
	3	111000	31000	92000	146000	1,1	4,1
	5	111000	31000	915000	34000	10,8	1,0
	8	111000	31000	523000	313000	6,2	8,9
	9	111000	31000				

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ANALYSIS OF THE MAIN FRACTIONS OF PROTEINS IN THE OUTER MEMBRANE OF E. COLI STRAINS DIFFERING IN THEIR CAPACITY TO SURVIVE IN THE AIR

Moscow ZHURNAL MIKROBIOLOGII EPIDEMOLOGII I IMMUNOBIOLOGII in Russian No 1, Jan 82 (manuscript received 27 Feb 81) pp 54-58

[Article by V. F. Konyukhov, M. E. Lyayman, L. Ya. Likhoded and L. A. Mal'tseva, Epidemiology and Microbiology Institute imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Text] The battle against infections that are spread by the airborne droplet mechanism, through which their agents are transmitted, is not always successful because of a number of unanswered questions, in particular the reason for the different survival capacities of bacteria in the air. There is a great deal of data in the literature showing that not only different types of bacteria, but also strains of the same type of bacteria can differ significantly in their ability to survive in the air [2]. Suggestions have been made about a connection between the sensitivity of different strains of bacteria to air and peculiarities in the structure and composition of their cell wall [4,5].

The most important structural and functional components of the membranes of bacterial cell walls are proteins and lipids, as is well known. There are two membranes in the cell wall of gram-negative bacteria--the outer membrane and the cytoplasmic membrane, which have a number of peculiarities in terms of structure and composition [9]. The outer membrane of gram-negative bacteria contains around 60 percent of all the proteins in the cell wall. The outer membrane of *E. coli* contains proteins, 70 percent of which have a molecular weight between 30,000 and 40,000, and which Schnaitman [14] designated as the "main outer membrane protein". Using sodium dodecylsulfate with electrophoresis in a polyacrylamide gel, Lugtenberg and coauthors [10] discovered that this protein consists of 4 fractions, which were designated as protein A (molecular weight 40,000), protein B (molecular weight 38,500), protein C (molecular weight 38,000), and protein D (molecular weight 36,000). Other authors have added to the main proteins of the outer membrane of *E. coli* proteins with molecular weights of 7000, 17,000 and a number of proteins with molecular weights over 40,000 [6,7]. On the basis of data in the literature, the major functional role of the main outer membrane proteins seems to be the formation of transmembrane channels or pores for transport of hydrophilic molecules; therefore these proteins are often called pore proteins [8].

There is evidence that many outer membrane proteins are involved in building the structure of the membrane [15]. The relationship of the different fractions of these proteins in the outer membrane plays an important role in the resistance of the bacterial cell to unfavorable factors, such as ultraviolet radiation, the action of detergents, antibiotics, enzymes, and so on, the effects of which can be seen in mutant bacteria deficient in outer membrane proteins [16].

Proceeding from these data, it was of interest to clarify the question of a connection between the peculiarities of the protein composition of the outer membrane and the degree of survival of bacteria in the air.

Materials and Methods. Strains of *E. coli* were used which differ in their survival in the air (see the table).

The capacity for survival in percent expresses the relationship between the number of reproducing cells, that is, cells able to produce colonies, and the total number of bacterial cells. To determine the survival capacity, 18-hour cultures of *E. coli* grown in a meat and peptone broth were washed off in a centrifuge with distilled water, the concentration was brought to $1 \cdot 10^9$ cells per ml, and sprayed using a direct-flow sprayer with a covering of finely dispersed particles of a bacterial suspension on a fiberglass microfilament in a special mounting, as described by Konyukhov and coauthors [1].

The preparations of purified outer membrane fractions were obtained using the method of Osborn and Munson [11]. Electrophoretic separation of the outer membrane proteins was done in a 10 percent polyacrylamide gel with 2 percent sodium dodecylsulfate [10]. The electrophoresis was done in glass tubes 100 mm in length and 4 mm in diameter. The molecular weights of the protein fractions were determined by comparing their positions on the column of gel to the positions of standard model preparations of pure proteins of known molecular weight, from which a calibrated chart was composed according to the method of Weber and Osborn. Crystalline preparations of bovine serum albumin, chicken egg albumin, chymotrypsinogen A and a lysozyme from the firm "Serva" were used as standards.

Results and Discussion. With the aim of clarifying the role of outer membrane proteins in the resistance of bacterial cells to the effects of the atmospheric environment, we used the mutant strain of *E. coli* K12, which is missing one or more of the main proteins of the outer membrane (see the table). The results of the research on the survival of these mutants showed that the lowest survival compared to the parent strain PC 2276 is found in its mutant PC 2277, which has a defect in protein B. In another mutant, PC 2282, which has a defect in outer membrane proteins C and D, survival was decreased to a lesser degree. These data provided a foundation for studying the spectrum of outer membrane fraction proteins in other strains of *E. coli*, which differ significantly in their capacity for survival in the air. These are the *E. coli* B strains WP-2 and BS-1, and the *E. coli* K12 strains GA₉ and GA₉/pSA50. Data on their survival are presented in the table.

The illustration shows the gels colored with stripes of outer membrane protein fractions after electrophoretic separation.

E. coli strains used in the study

<u>Strain</u>	<u>Genotypical Characteristics</u>	<u>Source from which strains were obtained</u>	<u>Survival in air with 30 percent residual humidity and 15 min exposure, in percent</u>
K12 PC 2276	thi, pro, lac Y, galk, xyl, ara, mtl, phx(λ), rpsL, sup E., growth at 42° C	W. Alphen, Netherlands	0.6
K12 PC 2277	thi, pro, lac Y, galk, xyl, ara, mtl, phx(λ), rpsL, sup E., missing protein B, lipopolysaccharide heptose-deficient, growth at 42° C	W. Alphen, Netherlands	0.01
K12 PC 2282	thi, pro, lac Y, galk, xyl, ara, mtl, phx(λ), rpsL, sup E., missing proteins C and D, growth at 42° C	W. Alphen, Netherlands	0.4
BWP-2	trp ⁻	E. M. Witkin, USA	15.0
BBS-1	trp ⁻ , uvr, exr ⁻ , fil	R. Hill, USA	2.5
K12 GA ₉	trp ⁻	G. I. Aleshkin, USSR	1.4
K12 GA ₉ /p SA50	trp ⁻ /amp ^R , nor ^R , uvr	G. I. Aleshkin, USSR	11.0

The electrophoretograms of the outer membrane proteins of the E. coli strains K12 PC 2276 and its derived mutants PC 2277 and PC 2282 were identical to the electrophoretograms of the main proteins described by Alphen and coauthors [3], which confirmed the reliability of the method for separating the outer membrane preparations, the conditions of electrophoretic separation, and the individual identification of each of the strains. Electrophoresis showed that the outer membrane of PC 2276 contains 4 main proteins: protein A with a molecular weight of 40,000; protein B with a molecular weight of 38,500; protein C with a molecular weight of 38,000; and protein D with a molecular weight of 36,000. The PC 2277 strain, which is a mutant of the preceding strain, has only 3 of the main proteins: protein A with a molecular weight of 40,000; protein C with a molecular weight of 38,000 and protein D with a molecular weight of 36,000; it is distinguished from the parent strain by the absence of protein B with a molecular weight of 38,500. The PC 2282 strain has only 2 of the main proteins in the outer membrane: protein A with a molecular weight of 40,000 and protein B with a molecular weight of 38,000.

The spectrum of the outer membrane proteins in the *E. coli* B strains WP-2 and BS-1 are shown in the illustration in gels 4 and 5. The outer membrane of WP-2 was determined to contain protein A (40,000), protein B (between 38,000 and 39,000) and protein D (36,000). Proteins with molecular weights of 50,000, 60,000, 30,000 and 20,000 were found in smaller quantities.

Outer membrane proteins of the BS-1 strain after electrophoresis separated into 2 main fractions in the positions of protein A and protein D, which differs from the WP-2 parent strain in the absence of one of the main fractions, protein B. Also revealed were protein fractions with molecular weights of 60,000, 50,000, 30,000 and 20,000.

Electrophoretic separation of outer membrane proteins of *E. coli* strains K12 GA₉ and GA₉/pSA50 carrying the pSA50 plasmid, are shown in the illustration (gels 6 and 7). The outer membrane of the GA₉ strain contains the full set of main protein fractions that have been discovered in the K12 *E. coli*, that is, proteins A, B, C and D.

In addition, smaller quantities of protein fractions were discovered in the positions corresponding to molecular weights of 50,000, 55,000, 33,000 and around 20,000 and 17,000.

In addition to the protein fractions found in the GA₉ strain, the outer membrane of the GA₉/pSA50 strain contains 2 clearly defined fractions in the positions corresponding to molecular weights of 70,000 and 80,000. This is probably due to the presence of the plasmid.

If the results of the separation of outer membrane protein fractions from strains of *E. coli* that are shown in the illustration are compared to the survival capacity in air, one can observe a correlation between the spectrum of the protein fractions and the level of survival. The strains that are mutants in terms of the main outer membrane proteins differ from the parent strains in that they have a greater sensitivity to exposure to air. The *E. coli* strains K12 and B that are missing the outer membrane protein B show a greater decrease in survival capacity than do the strains that are missing proteins C and D. Proceeding from these data, we can apparently assume that the loss of protein B is an important factor in the decrease in the survival capacity of the bacterial cell in the air. A number of communications have appeared in the literature recently concerning the properties of the main outer membrane proteins of *E. coli* [9, 10]. A great deal of attention has been given to protein B, which is called by a number of different names by different authors: Rosenbusch matrix protein, protein Ia, fraction 0-9 and others [7, 10, 13]. It is thought that this protein lies across the outer membrane, penetrates it, and is connected at one end to the lipopolysaccharide complex in the outer layer of the membrane and at the other end to the peptidoglycan; in addition to the primary functional role of transporting substrate molecules, it also serves as an important structural element in the membrane's architecture [12]. When this protein is missing due to mutation or suppression of its synthesis, its functional role of transporting substances can be taken over partially by other outer membrane proteins, such as D or

E [17]; at the same time, the protein's structural role may not be compensated for, which results in a reduction in the outer membrane's integrity.

On the other hand, the discovery of 2 outer membrane protein fractions in the GA₉/pSA50 strain that are not in the original GA₉ strain, with molecular weights of 70,000 and 80,000 correlates to the significant increase in the survival capacity of this strain in the air. Proteins with similar molecular weights are sometimes found in other strains of *E. coli* [7] and their function has been tied to utilization of iron ions from the environment. It does not seem possible, however, to fully identify the protein fractions that we have discovered with the outer membrane proteins described in the literature, and the same is true for their role in the outer membrane.

Conclusions

1. A correlation was noted between the survival capacity of *E. coli* cells in the air and the main proteins contained in their outer membranes. The absence of protein B in the outer membrane decreased the survival capacity of *E. coli* cells in the air.
2. The presence of plasmid pSA50 in the GA₉ strain of *E. coli* K12 helped increase the survival capacity in the air, and is correlated to the appearance in the outer membrane of 2 protein fractions with molecular weights of 70,000 and 80,000.

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CSO: 1840/377

UDC 616.932-008.97-036.12-056.43-092.9

DELAYED HYPERSENSITIVITY IN CHRONIC VIBRIO CHOLERAE CARRIER STATE IN
ANIMALS WITHOUT NORMAL MICROFLORA

Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian
No 11, Nov 80 (manuscript received 2 [month illegible] 80) pp 64-68

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[Abstract] Delayed hypersensitivity was studied in chronic carrier state for *V. cholerae* in CDr(SD) gnotobiotic rats maintained on sterile diet L-474 E-12. Two series of experiments were conducted: series 1 used 13 ex-microbe-free animals with induced carrier state for *V. cholera*, tested on days 8 and 31 of induced carrier state by a challenge with cholera antigen; tests were conducted 1 day after the challenge with 50 micro rams of the antigen in a 0.1 ml physiological solution. In series 2, a total of 10 experimental rats of the same line and age as in series 1 were contaminated with a nonpathogenic sporulating bacillus and challenged on day 8 of carrier state. It was shown that moderate allergy to *V. cholerae* developed in 8 of the 23 experimental animals at day 8 of the carrier state. Testing for specific allergen in positively reacting subjects in the lymph nodes revealed a picture of hyperergic inflammation. Figures 1; references 12: 6 Russian, 6 Western.

[398-9642]

SHIGELLA FLEXNERI MUTATION RESULTING IN APPEARANCE OF PHOSPHOMYCIN-RESISTANT AVIRULENT FORMS WITH IMPAIRMENT OF CARBOHYDRATE METABOLISM

Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 11, Nov 80 (manuscript received 28 Nov 79) pp 83-88

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[Abstract] An attempt was made to decode the nature of the *Shigella flexneri* mutation resulting in the pleiotropic effects of phosphomycin resistance, loss of virulence and appearance of the Pts phenotype using *S. flexneri* 2a and *E. coli* K12 and employing the mutant selection method of Lychev et al (1980): details of the plasmid translocation method are described. Mutation pts44 thus obtained matched the initial experimental requirements. Mapping of pts44 using phage Plkc in *E. coli* for pts44 x c pts 1 and pts44 x pur C pts H showed that pts44 possesses genes pur C and pts H. Meridiploids obtained by transferring the *Sh. flexneri* 2-44 strain carrying the pts44 mutation and the AUP'3 *E. coli* plasmid containing the purC+ptsI+ptsH+ part of the chromosome are capable of fermenting carbohydrates but do not affect bacterial resistance to phosphomycin. Determination of enzyme activity showed that *Sh. flexneri* possesses a phosphoenol pyruvate-dependent phosphotransferase system whose enzyme I participated in vitro phosphorylation of glucose in a culture medium containing HPr protein and enzyme II from an *E. coli* extract. Figures 2; references 20: 9 Russian, 11 Western.

[398-9642]

BIOPHYSICS

UDC 591.481.1: 001.1

WAYS OF STUDYING CONNECTION BETWEEN RATIONAL ACTIVITY IN MAMMALS AND BRAIN MORPHOLOGY

Moscow ZHURNAL OBSHCHEY BIOLOGII in Russian Vol 43, No 5, Sep-Oct 82
(manuscript received 31 Dec 81) pp 579-588

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[Abstract] Approaches to studies of the relationship between rational behavior in mammals and the brain morphology are reviewed. The work of Darwin, Sechenov, Severtson (1922) and Koehler (1921) in this area is briefly summarized. Studies on animal behavior are described and compared with parallel studies on ontogeny in mammals and birds. The evolutionary development of the mammalian brain shows the formation of integrative-type neurons, namely the pyramidal cells, and increasing complexity in the tactile apparatus adapted to perceive enormous amounts of information. Comparisons of the level of rational behavior in various taxonomic groups of mammals with the morphological organization of cortical neurons have shown definite parallels. Much of the published work on this subject points to the fact that many associative and commissural pathways start and end in layer III of the cerebral cortex. The work of D'yachkov (1979, 1980) on cerebral synapses in fish, amphibia, birds and mammals is discussed at length. Summarizing work published on this subject, the authors conclude: that layer III in the cortex plays a major role in adequate decisionmaking; that the level of rational behavior in animals is not necessarily determined by the presence of a neocortex (as seen in birds); and that the firmest sign of brain morphology indicating an ability for rational behavior is the degree of neuron complexity and the number of contacts between nerve cells.

Figures 3; references 43: 31 Russian, 12 Western.

[356-9642]

UDC 612.822.3.08

DEVICE FOR AUTOMATIC CLASSIFICATION OF DEGREE OF BRAIN ACTIVATION

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian
Vol 69, No 2, Feb 83 (manuscript received 4 Jan 82) pp 265-268

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[Abstract] Various scientific studies of human and animal brain bioflow require knowledge of the title activation, obtained in part by analyzing EEG data. With data collected over many years, the laboratory has developed a visual analysis system based on the 4 gradations of rest, (A_0), weak (A_1), moderate (A_2) and strong (A_3) activation. These are based on amplitude and frequency, and they have been used to develop a special electronic device that makes it possible with high accuracy to correlate a given value with the standard gradations. The operator can select the vector of measurement at will, and conduct more detailed evaluation of the EEG. Another feature is the compression of records to obtain a more efficient and more readily stored reading. Figures 4; references 3 (Russian).
[12131-360]

UDC 612.014.28

ATTACHMENT FOR STIMULATING DEVICE FOR FORMING A CALCULATED SERIES OF IMPULSES

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian
Vol 69, No 2, Feb 83 (manuscript received 11 Nov 81) pp 275-277

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[Abstract] Numerous physiological experiments related either to sensory stimuli of animals or nerve stimulation require a calculated number of stimuli, but most Soviet electronic stimulating devices lack such counters. The authors describe an attachment they have designed to fill the need for 1-127 impulses in a series. The device is diagrammed and described.
Figure 1; references 5 (Russian).
[12131-360]

SUCTION ELECTRODE WITH INTERNAL PERfusion

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian
Vol 69, No 2, Feb 83 (manuscript received 19 Nov 81) pp 272-274

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[Abstract] Early suction electrodes provided good fixation to the flesh, but had only 40-50% of the amplitude of microelectrodes and were unstable due to the so-called "healing effect." Increased negative pressure led to flesh damage. Later development partially solved these problems (Szekeres, L. and Szurgent, J., CARDIOVASCULAR RESEARCH, 1974 No 8, pp 132-137), but the authors sought to make a suction electrode capable of registering stable monophasic potentials over prolonged periods, for use in studying myocardic electrical properties. Their design, which is diagrammed and described, requires only slight negative pressure and thus causes minimal flesh damage. The flesh area subject to pressure is constantly perfused with a depolarizing solution, the internal electrode capillary does not contact the flesh and the external contact has a flexible rubber fixture. Figures 2; references 5: 1 Russian, 4 Western.

[12131-360]

BIOTECHNOLOGY

CONTROLLING PLANT MICROCLIMATE IN HOTHOUSES

Kiev RADYANS'KA UKRAYINA in Ukrainian 20 Feb 83 p 3

[Report of interview by S. Andrievskiy, engineer, with A. M. Litvinov; date and place not given]

[Text] At the laboratories of the Kiev Institute of Automation automatic control systems are born. These "smart" systems take up the automation of any industrial production which is probably not new. But today we are talking about something else--about an unusual laboratory where scientists are creating automation able to conduct interviews with individual plants in hothouses and later change plant living conditions according to their needs.

"Here is one of the control panels," states department chief, Candidate of Technical Sciences, A. M. Litvinov. A program may be written on it for automatic regulation of plant watering, temperature and amount of water, types of fertilizer and their concentration, etc. The above is for roots. Another control panel is used for the green upper part on which essential air temperature and moisture are set, strength and type of light, amount of radiation, even wind speed and direction in the hothouse, all thanks to screen controls.

[Question] Therefore, Anatoli'y Maksimovich, your automation supports the hothouse microclimate essential for plants?

[Answer] Yes, it does support it and when necessary changes it. Night follows day and this periodicity is reflected in plant genes. Without it the plants will die. Hothouse microclimate change with a change in the intensity of sun and thermal radiation, lighting and the like provides specific results and increases the harvest. It was not always as effective as we expected. Scientists from our institute along with colleagues from the Institute of Control Problems (Moscow) soon determined the reason for these modest results. We had neglected the most important point. How does the plant itself react to the proposed changes in the parameters of its environment? We, therefore, switched to the creation of an improved and, I would stress, more automated regulation of a whole complex of living conditions in the hothouse which is directed by the plant itself.

Don't be surprised by such an unexpected turn in my talk. Plants are best for the study of the effectiveness of hothouse changes in microclimate, watering, lighting--all things which fully assure plant photosynthesis conditions--their chief life process!

[Question] But how do we learn this from mute green stems?

[Answer] It was here that an original but basically simple way was proposed. A phytotron, a closed camera-surveyer measuring all parameters of living processes of one experimental plant, is set up in the hothouse. The plant grows in the phytotron under the same conditions as its numerous "relatives" in the whole hothouse. By its reaction to various stimuli the plant itself tells scientists what specific qualities in the climate promote growth and which hinder it.

These unusual "interviews" with plants, their analysis through mini-computers assist in the establishment of an optimal activity program according to which appropriate commands are given for heating, moistening, fertilizing, air carbon dioxide concentration not only in the indicating phytotron but also in all hothouses with similar types of vegetables. Thus, the plant itself suggests the most favorable climatic conditions for itself and its numerous "sisters".

V. A. Neskubin, senior scientific laboratory worker directs this project. Under his supervision this idea is put into effect on fifteen hothouse hectares of the "Moskovskiy" sovkhoz-combine which supplies fresh vegetables to Moscow. Next year an automated hothouse will be functioning at sovkhoz "Simferopol" in the Crimea.

What will be the result of this unusual dialog between electronic automation and our green friends? First, a sharp decrease in plant diseases, a considerable lowering of fuel-energy losses in hothouses and in numbers of service personnel. But, most importantly, the vegetable harvest in wintertime will increase sharply. According to estimates the expected economic effect will be almost forty thousand rubles from one harvest per each hothouse hectare. And the numbers of controlled hothouses will grow!

9443
CSO: 1840/344

ENVIRONMENT

UDC 58.04: 582.475(470.55/.57)

EFFECT OF FACTORY SMOKE ON GRASSY PINE FOREST IN SOUTH URALS

Moscow BIOLOGICHESKIYE NAUKI in Russian No 11, Nov 82
(manuscript received 6 Oct 81) pp 71-74

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[Abstract] A study was made of the effect of factory smoke on pine forests and individual species and an attempt made to clarify the parameters that can be easily discerned when characterizing the degree of damage to plant cover. Material for the study was collected in July-August 1979 in pine forests in a mountainous part of the South Urals where the effect of factory smoke is constant. The forest studied was made up of trees 45-60 years old, of composition 10S at density 0.7-0.8 and with a class III estimated productivity. A total of 20 tracts were included in the study; damage was judged from the condition of the needles and shoot growth; red bilberry growing with the pine was also studied. Studies showed that 3 zones could be distinguished: zone 1 located at a distance of 1.5-2 km from the factories included badly damaged pines; zone 2 at 3-4 km distance from the polluting source included moderate and mild damage; and zone 3 trees at a distance of 10 km from the factories showed no damage and were used as controls. In zones 1 and 2, the dominant trees included *Centaurea sibirika* L., *Calamagrostis epigeios* (L) Roth., and *Antennaria dioica* (L) Gaertn; the height, diameter and linear shoots on 40-60-year-old trees were less than in controls; a similar picture was seen in younger trees; red bilberry in these zones remained viable in local groves. It was found that the smoke apparently exerted a stimulating effect on growth in very young trees (10-15 years); further study is required to clarify the reasons for this phenomenon. References 9 (Russian).

[373-9642]

UDC 613.955+371.7]:612.017.2"52"

CIRCADIAN RHYTHM OF PHYSIOLOGICAL FUNCTIONS AS AN INDICATOR OF ENVIRONMENTAL ADAPTABILITY IN SCHOOLCHILDREN

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 83
(manuscript received 1 Jul 82) pp 37-40

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[Abstract] Evaluation of circadian rhythms in humans has shown that adaptability in general can be correlated with the spread between the maximum and minimum values of physiological parameters of interest. Such a spread is indicative of functional reserves suitable to meet new environmental situations, with key indicative factors consisting of the amplitude, periodicity, and frequency. Studies conducted on 18 Moscow pupils, ten to eleven years old, measured the circadian patterns of body temperature, heart rate, and systolic and diastolic blood pressure during different seasons, and confirmed the contention that such criteria can be used to predict adaptability to environmental changes. The plots for each measured physiologic function were evaluated as to the constancy criterion (position of maxima and minima), variability criterion (over a period of several days), and congruity (to which numerical values are assigned). Figures 2; references 16 (Russian).
[364-12172]

GENETICS

UDC 576.851.48.095.58

FORMATION OF DONOR STRAINS OF ENTEROPATHOGENIC ESCHERICHIA SEROLOGIC GROUPS 0112ac, 0129 AND 0143 AND SHIGELLA BOYDII USING R-PLASMID

Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 11, Nov 80 (manuscript received 20 Mar 80) pp 89-92

BORISOV, L. B., FILIPPENKO, O. V. and BABKOV, V. V., First Leningrad Medical Institute imeni I. P. Pavlov

[Abstract] A study was made of the feasibility of transferring plasmids RP4 and RPl-2 to *E. coli* 0112ac, 0129 and 0143 and *Shigella boydii* and using them to form donor strains of these bacteria. The plasmids were heat sensitive in replication and did not have markers for kanamycin resistance. Full details of the plasmid insertion using *Tn1* and *Tn9* transposons are given. In a first experimental series the R-plasmid from *E. coli* K12 was transferred to enteropathogenic *Escherichia* and *Sh. boydii* 8, obtaining transconjugants resistant to Cm and Tc or Ap and Tc at 31°C with an effectiveness of 3.6×10^{-5} to 4.8×10^{-4} . A study was then made of the ability of the *E. coli* 0112 ac, 0129 and 0143 and the *Sh. boydii* 8 to transfer chromosomal genes in conjugation; all strains were able to pass on RP4 plasmid and chromosomal genes. The significance of the results is discussed with reference to dysenterylike diseases. References 8: 7 Russian, 1 Western.

[398-9642]

METHODOLOGY IN THE EVALUATION OF MUTAGENICITY OF ELECTROMAGNETIC FACTORS

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 83
(manuscript received 23 Jul 82) pp 11-13

SHANDALA, M. G., RUDNEV, M. I. and SHMETUN, A. M., Kiev Scientific Research Institute of General and Communal Hygiene imeni A. N. Marzeyev

[Abstract] Several methods are considered and evaluated for suitability and sensitivity in the detection of electromagnetic mutagenicity at the gene, chromosome, and genome levels. The proposed battery of tests includes *Drosophila melanogaster* as a test object for *in vivo* investigation at the gene level of sex-linked recessive lethal mutations, cultured human peripheral blood lymphocytes for *in vitro* analysis of induced chromosomal abnormalities (chromosome level) and cellular aneuploidy and polyploidy (genome level), and mice and rats for *in vivo* studies at the genome or chromosome levels. Studies on the mutagenic effects of environmental electromagnetic waves should also be accompanied by evaluation of their potential embryotoxic, teratogenic, and gonadotoxic effects. References 18: 11 Russian, 7 Western.

[364-12172]

IMMUNOLOGY

UDC 576.851.45.097.29.097.3

IMMUNOGENIC ACTIVITY OF 'MOUSE' TOXIN FROM PLAGUE AGENT IN ANIMAL EXPERIMENTS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 3, Mar 81 (manuscript received 21 Jan 80) pp 39-42

YEVSTIGNEYEV, V. I., CHICHERIN, Yu. V., BYVALOV, A. A., PAUTOV, V. N., DODONOV, N. P. and KEDROV, O. A.

[Abstract] A study was made of the feasibility using "mouse" toxin (first isolated by Spivack and Karler and Ajl et al.) in pure form as an antigen to induce immunity against plague in laboratory animals. Experiments were conducted in guinea pigs and albino mice; glutaric aldehyde was used to prevent conversion of the toxins into antitoxins; T-antigen content was 20 mg/ml. Toxin was administered in doses of 3,000 micrograms in three injections at 2-week intervals; no immune protection was afforded in this series of experiments. The detoxifying properties of the antiplague serum were then determined. Finally, an attempt was made to determine the ability of commercial antiplague horse serum containing the T-antigen to neutralize the toxic properties of the T-antigen; findings showed that in this case the precipitation activity of the toxin was suppressed. The study confirmed published findings on the high toxicity of T-antigen for albino mice but not for guinea pigs. This indicates that the "mouse" toxin is only one of the factors in the pathogenicity of *Y. pestis*; its use as an active immunizing agent is doubtful. References 12: 6 Russian, 6 Western.

[396-9642]

METHODS FOR BIOLOGICAL TESTING OF ENTEROTOXINS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian
No 3, Mar 81 (manuscript received 25 Mar 80) pp 19-24

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[Abstract] Available methods for testing enterotoxins in infectious and toxic infectious diseases are reviewed. Many researchers use the classic ligated intestine test *in vivo*, following the demonstration of *V. cholerae* enterotoxin by this method; the biochemistry of this method is discussed and its advantages and disadvantages are assessed. Published work on the edema test in mice, rats and golden hamsters is described. The work of Donta et al (1973) using an adrenal cell culture to demonstrate thermolabile *E. coli* enterotoxin *in vitro*, and its further development are considered. The work of Sack and Sack (1975), Gurwitz (1977), and Guerrant et al (1973, 1974) is described. Analysis of the various methods covered in this review fails to highlight any single method as preferable; in many cases the findings are contradictory. A simple and sensitive test has been developed at the Leningrad Institute of Epidemiology and Microbiology imeni Pasteur for demonstrating the ability of *E. coli* to produce thermolabile enterotoxin. Most of the methods described need further refinement and study. It is concluded that the edema test in mice is possibly the best for demonstrating thermolabile enterotoxin, while the anal method for introducing test material is suitable for confirming its presence.

References 44: 3 Russian, 1 Hungarian, 40 Western.

[396-9642]

LASER EFFECTS

UDC 617.7.089.19

POLYMER MATERIALS IN LASER OPHTHALMOLOGY

Moscow IZVESTIYA AKADEMI NAUK SSSR. SERIYA FIZICHESKAYA in Russian Vol 46, No 10, 1982 pp 1996-1999

[Article by V. S. Akopyan, A. A. Berlin, A. L. Vinogradov, D. A. Gromov, Yu. K. Danileyko, K. M. Dyumayev, M. M. Krasnov, G. V. Krupnov, A. P. Maslyukov, G. A. Matyushin, L. P. Naumidi, V. S. Nechitaylo and A. M. Prokhorov, Physics Institute imeni P. N. Lebedev, USSR Academy of Sciences, and All-Union Scientific Research Institute of Eye Diseases

[Text] The use of Q-switched lasers in ophthalmology, first accomplished by M. M. Krasnov in 1971 at the suggestion of A. M. Prokhorov, opened up new prospects in treatment of a number of diseases of the anterior segment of the eye such as open- and closed-angle glaucoma, cataract, cysts of the iris and so on. One can now talk about an independent field of laser ophthalmology related to treatment of eye diseases by using powerful laser emission.

The optical elements of ophthalmological installations that utilize Q-switched lasers are subjected to the effects of radiation with output density, exceeding by several orders the emitted power density in pulsed laser installations operating in the free-lasing mode and in continuous lasers. The problem of laser stability of the elements of the optical circuits of Q-switched laser ophthalmological installations becomes especially acute in this regard. This problem has a number of specific aspects with regard to laser treatment of eye diseases, which are manifested to the greatest extent in the use of optical devices that provide laser intervention on the anterior segment and especially in the corner of the anterior chamber of the eye.

The essence of laser intervention in glaucoma includes formation of openings in the tissues of the corner of the anterior chamber of the eye by using giant emission pulses to facilitate drainage of the intraocular fluid from the eye cavity to the sanguiferous system. This leads to a reduction of intraocular pressure, i.e., to achievement of a therapeutic effect.

The structure of the anterior segment of the eye and the path of the beams with laser intervention are shown schematically in Figure 1. The corner of the anterior chamber, formed by the front surface of the root of the iris and the posterior surface of the cornea, is a region optically inaccessible to observation and laser intervention without auxiliary optical elements. Laser

irradiation of the corner of the anterior chamber of the eye is accomplished by using optical elements of already known designs (for example, van Boiningen's gonioscope (Figure 1, a)) and devices specially developed for laser treatment (Krasnov's goniolens (Figure 1, b)). In the case of using optical elements of van Boiningen's gonioscope type, the focused laser beam reaches the corner of the anterior chamber by reflection from the lateral edge of the gonioscope. The laser emission with intensity of $\sim 10^9$ W·cm⁻² is focused by means of a lens such that the emitted intensity comprises $\sim 10^9$ W·cm⁻² on the surface of the optical element contacting the iris and reaches $2 \cdot 10^{10}$ W·cm⁻² at the lens focus. The optical elements are subject to the effects of emission with similar levels of intensity with other types of laser interventions.

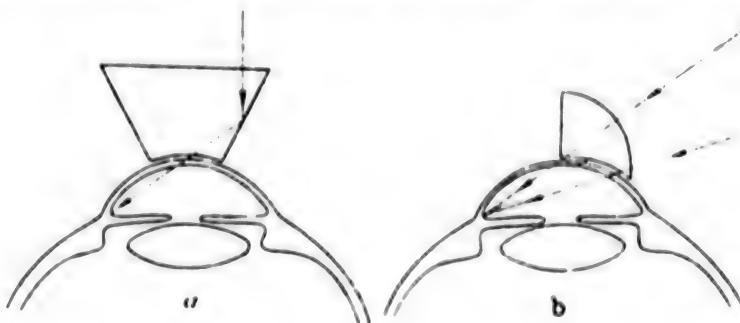


Figure 1. Path of Beams in Laser Treatment of Corner of Anterior Chamber of Eye Using van Boiningen's Gonioscope (a) and Krasnov's Goniolens (b)

These emission parameters are similar in values to the threshold levels of laser breakdown of traditionally used optical materials. A complicating factor is the possibility of focusing the laser emission directly into the space or onto the surface of the optical element in contact with the eye due to operator error during aiming. The emitted intensity reaches values of $2 \cdot 10^{10}$ W·cm⁻² in this case, which considerably exceed the threshold levels of breakdown of even such laser-resistant materials as fused quartz and sapphire. Not only is there significant cracking of the material in this case that leads to failure of the optical element but, which is more significant, there is damage to the cornea by the formed scars. Penetration of the iris by fragments of the material of the optical element causes epithelial edema and makes further intervention difficult. Moreover, damage to the epithelium may result in development of erosion of the cornea with the outcome of stable local cloudiness which reduces visual acuity.

Thus, the absence of optical materials with high laser surface strength, designed for manufacture of components that guarantee delivery of powerful light radiation to the object of intervention, delayed wide introduction of laser methods of treatment of diseases of the anterior segment of the eye into ophthalmological practice.

We suggested modified polymethylmethacrylate (MPMMA) for manufacture of these components [1]. The capability of using MPMMA was determined by its high

volumetric laser strength, comparable to that of the crystals and glass used in lasers, and similarly by its high laser surface strength. This feature, which sharply distinguishes polymers from other transparent dielectrics, is explained by the fact that the molecular characteristics of the additives introduced into the polymer and the viscoelastic properties of the polymer matrix (determined, for example, by the limit of forced elasticity) play a significant role in laser breakdown of transparent polymers. When polymer materials are treated, low-molecular fragments of macromolecules occur in the surface layer, which reduce the limit of forced elasticity of the surface layer and increase its laser strength compared to volumetric strength.

The specimens of MPMMA that we tested showed that they tolerate more than 10^3 emission pulses without forming visible breakdowns in the mass and on the surface of the specimens at the emitted intensities required to conduct laser operations ($\sim 10^9 \text{ W.cm}^{-2}$).

Moreover, breakdowns on the output surface of the MPMMA specimens are not observed even when emission with intensity of $2 \cdot 10^{10} \text{ W.cm}^{-2}$ is focused on it. A breakdown track measuring $\gtrsim 10 \mu\text{m}$, which has no significant effect on passage of the laser emission through the specimen, is observed in the surface layer of the polymer. At the same time, significant cavities measuring $\gtrsim 1 \text{ mm}$, formation of which is accompanied by discharge of quartz fragments, occur on the surface of fused quartz, which is one of the most laser-resistant materials, at the same incident emitted intensities. The quartz fragments are also the cause of damage to the cornea when conducting laser microsurgical operations on the eye using fused quartz elements. Our investigations showed that this threat of damage to the cornea also exists when using other transparent materials such as silicate glass, sapphire and so on to manufacture optical elements that introduce laser emission to the eye.

Thus, preliminary tests of specimens of modified polymethylmethacrylate showed its promise for manufacture of optical elements that guarantee introduction of powerful laser emission to the eye. The danger of injury to the cornea is completely eliminated in this case even if there is an accidental error of the operator in aiming the laser emission, when the incident beam is focussed on the surface of the optical element in contact with the eye.

No less important from a practical viewpoint is the problem of the method of manufacturing optical elements from MPMMA. Despite the difficulties of processing MPMMA, related to its comparatively low glass-transition temperature, we managed to work out a technique for precision machining of polymers that permits one to produce various components based on MPMMA for introduction of laser emission to the eye: van Boiningen's and Goldman's gonioscopes, Krasnov's goniolens and so on (see Figure 2), the optical characteristics of which are adequate for practical use of them.

The manufactured elements were tested at the Department of Laser Methods of Treatment, All-Union Scientific Research Institute of Eye Diseases. Ruby and garnet laser ophthalmological installations were used in the experiments. Q-switching was accomplished by using polymer clarifying filters based on modified polymethylmethacrylate with the following clarifying dyes introduced to

it: vanadyl phthalocyanine and dithiobenzyl complexes of nickel for ruby and neodymium lasers, respectively. The laser emission with intensity of $\sim 3 \cdot 10^7$ W.cm $^{-2}$ was focused inside the eye by a lens with focal distance of $F = 70$ mm and in this case the emitted intensity was $\sim 10^9$ W.cm $^{-2}$ on the surface of the optical element in contact with the eye. Optical elements manufactured on the basis of MPMMA tolerated more than 10^3 emission pulses under the indicated conditions and fully retained their efficiency. We note that ruby and neodymium lasers with polymer clarifying filters essentially did not change their characteristics even after 10^4 responses.

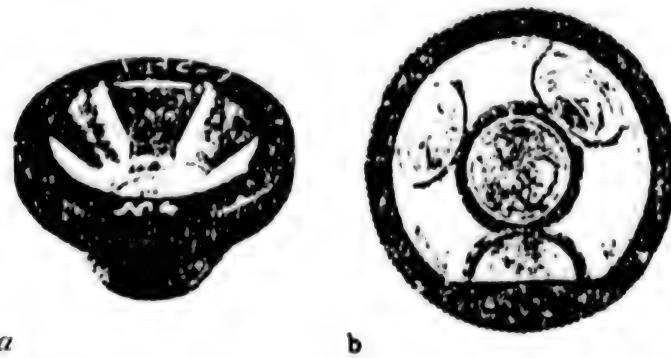


Figure 2. Different Versions of Design of Optical Elements of Modified Polymethylmethacrylate: a--van Boeningen's gonioscope; b--Goldman's gonioscope

A total of 32 patients have now been subjected to laser treatment using the polymer optical elements that we developed. The functional outcome of laser interventions using the developed optical elements exceeds the results of traditional methods of laser treatment.

Thus, optical elements designed to introduce powerful laser emission into the eye when conducting microsurgical operations were developed on the basis of laser-resistant polymer materials for the first time in worldwide ophthalmological practice and technical and clinical tests of them were conducted. We feel that elements of modified polymethylmethacrylate are more promising for broad application in laser ophthalmology.

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CSO: 8144/0990

NEED CITED FOR UNDERSTANDING MECHANISMS AT WORK IN LASER THERAPY

Moscow IZVESTIYA in Russian 27 Mar 83 p 3

[Article by B. Konovalov, science reviewer, "IZVESTIYA": "On the Front Lines of Science--Healing with Light"]

[Text] Medicine, even today, remains largely a therapeutic art. It is, however, in the process of rapidly becoming a science guaranteeing a safe therapeutic result to any physician with certain advanced procedures at his disposal. Physics, biology, chemistry, mathematics and other basic disciplines have helped medicine move ahead in its development. Indeed, physicians themselves have not been idle.

One of the most important inventions of our XXth century (a century that has been rich in discoveries) has not escaped their notice--the sources of laser radiation. With the advent of standard, comparatively cheap neon-helium lasers, physicians began by a method of trial and error, or, to put it simply, by groping their way, to try to use this new form of radiation.

They started using laser light to treat various ulcers, skin diseases, and then in stomatology, laser surgery where the scalpel was replaced by a laser. A new specialization was formed--laser medicine--with a good deal of help from physicists, particularly from one of the most important of our specialists in the area of radioelectronics--Hero of Socialist Labor and Academician N. D. Devyatkov. We have held All-Union conferences since the mid-70's on the use of lasers in medicine.

At the same time, however, many scientists have approached this trend with skepticism and have been inclined to feel that it was not a direct therapeutic result being observed, but rather psychotherapy in its own right. The fashionable and trendy word "laser" works magic in the patients, they say--this secret red light generated in the womb of a complex physical apparatus. In a word, this is shamanism, not science.

The skepticism is based on rather simple arguments. The power of the neon-helium laser is very low--a total of one milliwatt per square centimeter (as in a flashlight bulb). Exposure lasts for 3-5 minutes. The dose received by the patient is less than if he were exposed to sunlight for the

same amount of time. It is well known that there is a band of red light in the spectrum of solar radiation. The human body has adapted to it beautifully for millions of years of evolution (with the possible exception of the internal organs). It is hard to understand how an insignificant addition of light for a brief instant can somehow affect biological processes.

To solve their problem the physicists referred to the fundamental properties of lasers, their so-called coherence (simply speaking, emission of a strong given wavelength). But during an interaction with biological molecules, the coherence of a laser emission is lost momentarily--for trillionths of a second.

"To be honest I began my study intending to prove that laser light does not cause a biological reaction," confesses Professor V. S. Letokhov, "but I turned out to be wrong."

Vladilen Stepanovich, a well-known physicist and deputy director of the USSR Academy of Sciences Institute of Spectroscopy, one of the founders of laser chemistry and Lenin Prize Laureate, must be glad that a fortuitous circumstance brought him together with laser medicine.

While doing studies on the reaction of ultraviolet laser radiation impulses on biological molecules, the group of workers that he heads at the Institute of Spectroscopy at the USSR Academy of Sciences and the Scientific Research Center on Laser Technology decided to examine how cells react to the effect of red laser light.

HeLa cells known to researchers all over the world were chosen as test objects. They were prepared in culture tubes under mild conditions. The cells were exposed to a special nutrient solution containing radioactive isotopes for activity determinations.

These radioactive labels were measured in radiation counters. Physicists and biologists decided to see the effect that irradiation with red light from a neon-helium laser had on the activity of the cells. To their surprise, radiation gave rise to marked acceleration of synthesis of DNA--desoxyribonucleic acid--the "core" of the genetic apparatus, responsible for the transmittal of hereditary traits in cell multiplication. The effect was clear. DNA synthesis was double that of cells in the control group that had not been subjected to radiation.

The researchers then decided to prove whether or not coherence of the laser beam was important in this regard. They proceeded simply: they took a bright bulb from a normal filmosope [possibly, a Russian projector?] passed the light through a filter to make it red, and began to irradiate the cells. The effect was the same as that of that the laser!

The scientists then took this opportunity to lightly retune the wave of the light radiation and studied at which wave lengths there was a corresponding cell reaction. They determined that the area of appreciable biological reaction lay in the range of 610-640 nanometers (billionths of a meter).

The wavelength of the neon-helium laser is 638 nanometers--just at the margin of the effective band of the spectrum. Thus, the medical workers, using a neon-helium laser, found the area of unique light therapy by chance.

The physicists were joined in their conclusions by the medical workers. The possibility of curing ulcer disease by using normal red light in place of the laser, provided by a simple apparatus assembled by L. V. Paramonov, a member of the staff at Gorkiy University, was first tested at the Gorkiy Medical Institute under the directorship of V. F. Novikov, candidate of medical sciences. The effect was obvious. Then, at the behest of the director of the Moscow Oblast Scientific Research Clinical Institute (MONIKI), Professor A. M. Sazonova, this problem was studied in Moscow in close collaboration with the Institute of Spectroscopy.

G. A. Romanov, the chief of the endoscopy department of the clinical surgery division of MONIKI and candidate of medical sciences, conducted for me one of the treatment sessions for gastric ulcer according to the new procedure. A thin, flexible fiberglass tube, covered with a special coating so as not to harm the body, is inserted into the patient. This part of the apparatus is called the endoscope. Along the length of the fiberglass, a small amount of light from a 300 watt bulb, filtered to block out all components of the spectrum except red light reaches into the body. The doctor sees the image of the stomach on a special screen and can direct the light directly onto the ulcer. Sergey K., a student who was undergoing a course of treatment, had undergone 7 sessions. On the first visit the ulcer measured 1.5 cm in diameter, now it was already 3-4 millimeters. The pain was relieved after his first visit. He then needed only a few sessions for a total cure. And that session, which took place before my eyes, took three minutes in all. Outpatient therapy. As a rule, though, ulcer patients are hospitalized for 1-2 months.

"We had 165 patients between 1982 and March 1983," says Genadiy Alexandrovich Romanov. The majority of these were chronic ulcer patients. They were normally disabled for several times a year. Laser and red light therapy were more effective than conventional methods. The ulcers heal 3-4 times faster. New epithelium grows and the affected wall becomes as smooth as before. Drug therapy, though, leaves a hard scar which deprives the gastric tissues of the elasticity they need to fulfill their function in the body.

Statistics indicate that three out of a thousand people in our country are ulcer patients. This is several tens of thousands of patients. A huge amount of lost work time. Clinics full. Thus, red-light treatment with a regular bulb is tremendously important from an economic standpoint. The laser, which costs several thousands and requires skilled maintenance, can only be used by institutes and the occasional hospital. But a light bulb and filter are attainable by even a rural hospital. It is true that an endoscope is required for them, just as in laser therapy. But this instrument somehow or other is required of any modern clinic for examining internal organs. We have domestically-produced endoscopes at our disposal. Arrangements must be made for their mass production.

It is clear that light therapy has a great future. Already at the present stage of research, questions concerning its mass introduction can and obviously should be asked. There is, however, one small "but"...

At present, there is no clear understanding of the mechanism of light reaction on biological processes. There is a large body of hypothesis and conjecture; intense study is being done. Professor V. S. Letokhov feels that this problem can be solved in a very short time through the combined efforts of the physics and biology institutes.

At this stage of the research, it is extremely important that the veneer of mysticism be lifted once and for all from the new procedure and that the scientific basis for the light reaction be clearly indicated. Science requires repetition of an experiment, a stable result and the possibility to follow it up and confirm it in any other laboratory. This has been done. Studies have been developed: new bands of radiation in the ultraviolet and far red areas of the spectrum which stimulate biological processes have been observed. The effect has been confirmed at different "stages" of biological composition--cells, yeasts, bacteria. More work needs to be done and a theory of the phenomena that have been observed needs to be formulated.

These studies have automatically led to another specialized use for the laser at the present time which has long been a source of argument. The fact is that the question of the light ray's biological action is just as important from an agricultural standpoint as from a medical one. I remember that even in 1972 when the first All-Union Scientific Technical Conference on the use of renewable energy sources was held in Tashkent, one of its sections considered questions of increasing the yields of various seeds by exposure to light rays prior to sowing. Since that time, several All-Union conferences and meetings have been held on this subject. Representatives of dozens of institutes, kolkhozes and sovkhozes carried out experimental studies in fields and greenhouses and gave reports at these conferences on their encouraging results. It was proven that exposing seeds to light prior to sowing can increase the production of wheat, vegetables, and the most varied agricultural crops by at least several percents, and this can be a considerable addition to the yield.

Unfortunately, however, researchers have made little headway in the last ten years in understanding the mechanism of this reaction. Apparatus has been created for radiation, whereby seeds undergo intense exposure not only to normal light, but to concentrated solar and laser light according to the principle of "You won't spoil porridge with butter." [Translator: Probably the Russian equivalent of "You can't have too much of a good thing."] Exactly what produces this biological reaction, however, is unclear up to this point.

To sum up, at one "pole" of the problem inconclusive or ignorant explanations of phenomena spring up, and at the other--open doubts in the presence of a result; in the dust of all the controversy the label "pseudo science" has even been applied, although bitter historical experience should have taught us that it is important to interpret this term accurately, to say the least.

This is an important question but apparently there has not been enough concentrated effort and not enough highly qualified specialists have been drawn to it so as to grasp the essence of the phenomenon.

Obviously the USSR State Committee for Science and Technology under whose auspices the aforementioned USSR Academy of Sciences conferences and meetings were carried out, must investigate the situation and create some sort of informal group of qualified scientists--physicists, biologists, geneticists and agricultural specialists for an effective solution to the problem.

The social mandate to solve this problem has existed for a long time already, but for many years no progress at all was made. It is fully within the power of scientists from the Academy to solve this problem. And it must be decided not in "duels" with words but in the laboratories and in the fields.

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CSO: 1840/337

EFFECT OF LASER TECHNOLOGY ON AGRICULTURE AND MEDICINE NOTED

Moscow VOZDUSHNYY TRANSPORT in Russian 19 Feb 83 pp 3-4

[Interview by A. Kondratov of V. M. Inyushin, professor, doctor of biological sciences: "Bioenergetics: Laser Acceleration"]

[Text] Professor Victor Mikhaylovich Inyushin, doctor of biological sciences, chairman of the committee on bioenergetics of the KaSSSR and director of the educational-scientific-industrial society "Biofizika" [Biophysics] at Kazakh State University is justly considered one of our country's most important specialists on the use of the laser in biology.

Our correspondent, the well-known popularizer of science and Candidate of Philological Sciences A. Kondratov, converses with the scientist from Alma-Ata concerning the future of laser use in agriculture as well as in medicine.

[K.] People from extremely diverse professions--from agronomists to cosmonauts--have been called upon to contribute to the realization of the USSR food program. The role of science in agriculture today has become an extremely important one, and we are hearing more frequently about the laser beam as a powerful stimulus for increasing yields...

[I.] The artificial laser beam is a thousand times more concentrated than normal light, infinitely more oriented in time and in space, and has as much energy as though it were compressed a million times. It was a secret in the not-too-distant past and is now exploding the concept of the entire huge world of living nature, opening new and unforeseen vistas for biology, genetics, and primarily for agriculture.

[K.] "From Plow to Laser"--this, Victor Mikhaylovich, is what your studies in the field of "laser" agriculture are called. Laser apparatus is at work in many of our country's kolkhoz and sovkhoz fields. Laser exposure both improves and "accelerates" yields for wheat, tomatoes, apples and many other grains, vegetables and fruits. But how does a laser beam perform this miracle?

[I.] Light--this is such an everyday concept that we hardly think about it in its true sense. Photosynthesis is the basic process for forming organic matter on our planet. Agriculture is founded on solar energy. We are, however, witnesses to a paradox: before the advent of lasers, agricultural capacity was increased only by improving soil condition and the traditional choices of soil material.

[K.] But the laser allows the harnessing of solar energy "without having to depend on the sun?"

[I.] Extra solar energy can be introduced to seeds, tubers and pollen, the bioenergetic accumulators, by using a laser, effecting a unique recharging and excitation and saturating them with bioenergy. Numerous studies of the results of mild laser irradiation of the seeds has given us proof that this beam acts as a "trigger mechanism," inducing a number of more energy-consuming reactions and activating the potential resources of the cell itself.

[K.] And how does this occur?

[I.] Plants love mild irradiation and its color, its area of the spectrum. This indicates that there is a single mechanism by which plants assimilate the sun's energy, one mechanism for the formation and development of the entire growing world. Entering into the intimate life of the cell, the photons act on the fundamental processes within it. Under stable conditions a cell apparently uses only a part of the genetic information incorporated within it. The remaining portion--the reserve--is "frozen" and information that has probably been "remembered" in the genetic code for millions of years appears under extraordinary circumstances. The potential resources of a species or variety of plant are manifested in a unique genetic "burst".

[K.] And can such "bursts" occur under the effect of artificial radiation as well as natural, created by technology rather than nature?

[I.] At the high-altitude Pamir botanical gardens, potatoes weighing 4 kilos and sunflowers with fifty heads per stalk are growing. Why? Indeed, it is because the conditions here are extraordinary: radiation received by the plant is 50 times higher. The biological "burst" here is caused by the effect of ultraviolet. Similarly, at Pamir there is an apple tree growing that is 160 years old. It bears fruit two times over the short summer at high altitude. And under normal conditions during a warm autumn the trees sometimes start to bloom a second time. The plants simply "mix up" the seasons of the year under the influence of good conditions, and they set their "biological clocks" into motion at the most unsuitable times. Such bursts, however, are a rare occurrence. The time has come to accelerate the rate of the "biological clock" by using a low-power laser beam.

[K.] Laser agricultural technology--this is already said to be a reality. In fact, at present they are trying to use the laser in poultry and live-stock breeding. Moreover, specialists are studying the possibility of the effect of the laser on man for therapeutic purposes...

[I.] The modern poultry farm is in essence a factory producing eggs and meat. However, in the last few years a few of these factories have begun to have problems. After getting all sorts of good food, the chickens are beginning to fail and get sick. This is an extremely pressing problem today, being studied by different specialists. I think the major problem here is that on these farms the laws of bioenergy are not studied, or are even totally ignored. Recent studies on light in livestock breeding areas are better proof of this. It was proven that the duration of daylight and the intensity of the luminous flux are most important factors. Experiments on poultry farms in Kazakhstan and the Leningrad Oblast indicated that by using laser technology the vitality and hardiness of the young stock increased significantly.

In experiments where laser-activated liquid feed was given to young cattle, weight gain was 18% higher than the norm. The understanding and analysis of the laws of bioenergy have been put to significant practical use. But, on the other hand, a whole raft of new problems is arising, whose solution will come in the future.

[K.] And these problems are apparently concerned with the general provisions of bioenergetics?

[I.] Yes, this is correct. Take the human body--it is made up of atoms and molecules of the chemical elements from Mendeleev's table. Substances represented in liquid, gaseous and solid states enter into the makeup of a living substrate. But there is also a fourth state of matter, plasma, in which the body is represented not by atoms and molecules but by a mixture of charged particles or ions. It can now be said with conviction that almost all matter in the universe is found in the plasma state.

[K.] And if the macrocosmos of the universe is full of plasma, then also the microcosmos of life must be plasma, i.e., found in some sort of special state of matter—not solid, not liquid, not gaseous, but plasmatic, more precisely bioplasmatic?

[I.] If the world is physical and is an entity, then somehow it goes without saying that the answer must be yes. Indeed this state, plasma, is most widespread in the universe around us. It must also be represented in a living substrate.

[K.] And how do you interpret bioplasm? Indeed, scholars interpret bioplasm differently; some of them absolutely deny its existence.

[I.] An analogy can be drawn between bioplasm and reinforced concrete construction, where different types of materials create a very durable construction material. The most important property of bioplasm is its orderliness, its unusual durability when saturated with energy. Bioplasm is a medium in which different electromagnetic, sound, and possibly gravitational waves are distributed. For example, a wave field with strong wave characteristics is "frozen" into bioplasm. Something like a solitary organism hologram is created. Each part of this hologram contains a characteristic of

the most essential properties of the entire organism, and this opens up completely new ways of approaching the study of brain memory and the nature of heredity.

[K.] And in your opinion, is the notorious biofield, about which so much has been argued and written, related to bioplasm?

[I.] A hologram is "frozen" into the bioplasm, and this is probably the biofield. My colleagues and I propose that bioplasm is the medium in which it is possible to form the bases of the biofield, its foundation. According to our conception, the biofield is the synthesis of real physical fields, with definite physical parameters and configuration. Their preservation depends on bioplasm in the absence of thermal noises.

[K.] And do all living substances composed of bioplasm have this biofield--plants, animals and people?

[I.] In 1968 it was established in our laboratory, with the help of A. Romen, candidate of medical sciences, that plants react to changes in the human biofield, particularly under various direct autosuggestion conditions. The effect was observed at a distance of up to one meter. Interesting experiments by the well-known American scholar K. Bakster [Baxter] indicated that electrical characteristics of the plants underwent abrupt change because of the fact that shrimp were dying in vessels placed near them. This apparently means that all representatives of the living world are allotted a biofield.

[K.] But if this is the case, then the human biofield is related to man's vital tone, state of health, well-being--and it can be improved with the help of autosuggestion, by means of the inner resources of the body and by the external effect of a laser?

[I.] So far only the first experiments on laser "excitation" of the body and laser therapy have been carried out. There are a great many problems here, in fact, regarding precise measurement, determination of the amount of radiation, time of the procedures, analysis of the daily and other rhythms of the body (at the present time about 40 physiological functions are known, susceptible to marked cyclic changes with a period, close to 24 hours), and finding the points of the body through which the laser reaction must pass.

[K.] And are these acupuncture points?

[I.] Chinese physicians, as the result of 1000 years of meticulous observation, discovered 693 points in the human body which when stimulated give fully predictable physiological reaction and therapeutic effect. Japanese medical literature cites 120 points in all. The majority of them exhibit elevated electrical conductivity. However, there is not a single opinion on the question of the biological nature of these points ("light puncture") done instead of the traditional acupuncture or modern "electropuncture" had a similar effect. Above all, the experiments showed that people showed a change

in the entire complex of electrical properties, resistance, charge values of the protein globules, membranes, etc., under the influence of laser light.

Photoelectrical phenomena, then, are the basis of the primary physiochemical shifts at the point during a laser beam reaction. They also change the degree of energy absorption by the bioplasm since they are initiators of the acceleration or retardation of physiological and biochemical processes.

[K.] But not only can the effect of the laser beam on these points effectively cure sick people, it can eliminate fatigue and improve a person's vitality. Perhaps civil aviation flight personnel will be allowed and even be required to undergo laser stimulation prior to, after and even during flight (if a compact laser unit can be brought on board the airplane) in the not-too-distant future.

[I.] Our ties with civil aviation are more than desirable. But complexity of research and contact with different organizations are imperative in this regard. I believe that the laser beam will not only help people on land, but also in the skies flown by our aircraft.

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HELIUM-NEON LASER TREATMENT OF CORNEAL DISEASES

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[Abstract] Considering the favorable influence of helium-neon laser radiation on restorative processes in various tissues, the authors irradiated patients with various keratites. Seven men and 5 women 40 to 65 years of age were studied with diagnosis of neurotrophic keratitis, post-traumatic purulent ulcerative keratitis with tendency toward perforation, bullous keratopathy after cataract extraction and glaucoma operation post-operative condition. Laser radiation was used on all patients after long-term unsuccessful conservative therapy. Complaints included pain, photophobia, lacrimation and reduced vision. Beginning in the second or third session pain, photophobia and lacrimation decreased. By the fifth session gradual clarification, decreased edema of corneal stroma, epithelialization of ulcerous surface and disappearance of bullous formations were observed. By the end of the course of ten sessions of treatment with a $30-100 \text{ mW/cm}^2$ laser beam, duration increasing from 1 minute to 5 minutes during the course of the treatments, subjective complaints disappeared in four patients with neurotrophic keratitis. Of two patients with post-traumatic keratitis, in one case ulcers resolved, epithelialization and scarring of the cornea occurred. In the other the ulcers resolved, epithelialization began but a descemetocele formed at the center of the ulcer requiring surgery. In four patients with post-operative keratopathy almost complete recovery occurred. The observations indicate that laser radiation has a stimulating effect on trophic processes in the cornea. References 5 (Russian).

[355-6508]

MEDICINE

UDC: 616-073.756.5(470)

INCREASING QUALITY OF MASS FLUOROGRAPHIC EXAMINATIONS IN RSFSR

Moscow VESTNIK RENTGENOLOGII IRADIOLOGII in Russian No 6, Nov-Dec 82
(manuscript received 13 Nov 81) pp 66-69

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[Abstract] Each year an average of 60 million persons in the RSFSR are fluorographically examined by the network of 3800 fluorographs in the republic. Central regional hospitals and ambulatory polyclinic institutions are now being equipped with fluorographs to allow broader coverage of the population including rural residents. However, many persons with active tuberculosis and lung cancer are first diagnosed upon presentation with active symptoms rather than in routine fluorographic examinations. Retrospective analysis of pulmonary pathology is suggested as a means for improving the effectiveness of mass routine fluorography. Problems encountered include superficial or episodic analysis of fluorograms and erroneous diagnosis due to lack of training and experience of personnel performing the examinations. [403-6508]

UDC 615.387 + 615.832.9]: 001.8(47 + 57)

STATUS OF AND PROSPECTS FOR DEVELOPMENT OF COLD STORAGE METHODS FOR BLOOD CELLS IN USSR

Moscow GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian Vol 28, No 1, Jan 83
(manuscript received 2 Jul 82) pp 3-6

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[Abstract] Cryogenic storage of blood cells in the USSR is reviewed. The center for this work is the Central Scientific Research Institute of

Hematology and Blood Transfusion, along with certain other establishments in Leningrad, Kiev and Lvov and the Uzbek SSR), where theoretical and practical work on this problem has been conducted since the Fifties. Two very successful methods have been developed for red cell storage, namely the fast-freeze method using liquid nitrogen at -150°C to -196°C, and the slow-freeze method in electric refrigerators (-30°C to -100°C) using glycerin, polyvinylpyrrolidone (povidone), polyethylene oxide, mannitol and other substances; the former method is used extensively. Details of cryogenic equipment and in vitro and in vivo studies are presented. The clinical use of stored blood is considered. Special techniques for storing leukocytes and lymphocytes are described; success with the latter has been gained with the use of dimethylacetamide as a cryogenic protection agent and special freezing techniques. The search for new and better blood storage methods is being pursued along the avenue of longer retention of structural and functional integrity in frozen cells after thawing, with particular reference to the cell membrane. References 10: 8 Russian, 2 Western.

[375-9642]

UDC 615.38.002.3: 658.8.03P

MOTIVATION OF DONORS NOT RECEIVING PAYMENT

Moscow GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian Vol 28, No 1, Jan 83
(manuscript received 12 Apr 82) pp 47-49

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[Abstract] A study was conducted in the summer of 1981 among workers at the Lytkarniskiy Optical Glass Plant in Moscow Oblast to clarify the motives inducing individuals to act as donors without receiving payment. Questionnaires were completed by 508 donors giving blood during a blood-donor session at the plant and by other workers at the plant not given blood (337 nondonors and 67 former donors). Reasons given for providing blood without recompense included peer pressure, a sense of civic duty, purely humanitarian reasons (a relation needing blood or an unknown patient in urgent need of blood), and as the result of conversations with medical personnel or in response to appeals for blood made on radio or television. A small contingent of donors gave their reasons as a desire to have extra holidays or bonuses and as the result of pressure from the plant administration. Most individuals refusing to give blood gave as their reason either fear of giving blood or that they thought giving blood would be harmful to their health (38%) or because of their health status (35%); only 1.5% of those not giving blood gave as their reason the lack of recompense for so doing. Former donors had ceased to give blood because of health deterioration (54%) or because they were unable to attend the donor clinic because of their work commitments (21%). It is concluded that better organization of blood-donor clinics and information on giving blood will increase the numbers of those giving blood without recompense. No references.

[375-9642]

UDC 579.253.086.3

MODES OF FORMATION OF ELEMENTARY BODIES AND THEIR RELEASE FROM THE CELL IN BACTERIAL L-FORMS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 1, Jan 82 (manuscript received 15 Dec 80) pp 44-48

[Article by N. D. Konstantinova, L. N. Kats and S. V. Prozorovskiy, Epidemiology and Microbiology Institute imeni N. F. Gamaleya, USSR Academy of Medical Sciences, Moscow]

[Text] Cells measuring between 0.24 and 0.5 microns which are minimal L-form reproductive elements and are apparently the main form of their persistence in a cell should be formally considered elementary bodies [15, 17, 19]. Earlier, we reported on the existence of several types of elementary bodies differing in their submicroscopic structure, several of which were potentially viable and consequently could play a role in the reproduction of L-forms [7].

The goal of the present work was the study of modes of formation of elementary bodies and their release from the cell with the aid of various methods of electron microscopy.*

Materials and Methods. Used in this study were cultures of stable and unstable L-forms *Proteus vulgaris* [2], *Bac. subtilis* [11, 12], stable L-forms *Listeria monocytogenes* [8, 9], *S. pyogenes*, *S. aureus* [6], and unstable L-forms *Brucella abortus* [13], *Vibrio NAG* [6] (the works cited contain descriptions of the cultures of the L-forms indicated).

The research was conducted using the method of ultrathin sections, freezing and slicing and scanning electron microscopy. When making the ultrathin sections, the cells were fixed with 2.5 percent glutaraldehyde in a 0.15 M phosphate buffer, pH 7.2, with 0.5 M sucrose and 0.01 M $MgCl_2$ for 3 min, and then 0.1 percent OsO_4 in the same buffer for 18 h at room temperature, dehydrated in alcohol and enclosed in araldite ("Serva" or "Schuchart"). The ultrathin sections were made with the ultratome III-LKB-8800 and contrasted with uranylacetate. The preparations were viewed and photographed under the JEM-100B microscope using instrumental magnification of 30,000 and 50,000 and accelerating tension of 80 kilovolts.

*The authors express their gratitude to Professor A. F. Bykovskiy for his valuable advice given during discussion of the present article.

The freezing and slicing of the L-form *Bac. subtilis* cells was done in liquid freon cooled by liquid nitrogen with no preliminary fixation, using 20 percent glycerine as a cryoprotective agent, according to the method previously described [14]. The microscopy conditions were the same.

In the application of the method of scanning electron microscopy, the cells were fixed using the method described above, they were dehydrated in alcohol, dried in the air, dusted with carbon and platinum using a circular duster on a rotating stand. The samples were photographed under a scanning electron microscope JSM-50A with instrumental magnification from 200 to 30,000.

Results and Discussion. It has been observed earlier that elementary bodies can undergo binary fission [10]. The division of elementary bodies can take place outside as well as inside the mother cell. Sometimes they divide inside a vacuole. This mode of formation of elementary bodies, however, is certainly not the primary one. Mass formation of elementary bodies is observed in the so-called spherical and large bodies, that is, in the characteristic elements of the L-population. Here the modes of formation of elementary bodies can be varied. The elementary bodies can form on the surface of the cells by a budding process, as well as inside the cell in the cytoplasm or perinuclear area.

The formation of elementary bodies on the cell surface can be followed especially clearly using a scanning electron microscope, which makes it possible to obtain a 3-dimensional image of the subject. The formation of elementary bodies can take place in cells undergoing binary fission, and the elementary bodies can remain joined for some time with the mother cell with the aid of anastomoses. The formation of elementary bodies inside the cell can also be observed using a scanning electron microscope if the cell has been partially lysed. This method, however, does not allow observation of the internal structure of the elementary bodies.

Using the method of freezing and slicing or freezing with subsequent etching also allows observation of the formation of elementary bodies. In this case we can study not only one mode or another of formation of elementary bodies, we can also determine the structure of the surfaces of the section of the membrane of the elementary bodies, that is, the inner structure of the membrane.

Finally, using the method of ultrathin sections, we can obtain more complete information about the internal structure of elementary bodies formed by different modes, as well as about their interactions with the mother cell. Having applied this method, we observed different stages in the successive formation of elementary bodies via the budding process. In elementary bodies that have been formed by budding, the cytoplasmic membrane has, as a rule, a 3-layered structure; using the given method of fixation, however, this structure is not revealed in all elementary bodies. Some elementary bodies have a morphologically expressed nucleoid.

If elementary bodies are formed inside the cell, they can be arranged among the granular component of the cytoplasm alone, in pairs, or in groups. Their formation begins with a thickening of part of the cytoplasm, around which

first a less dense area forms, then a small vacuole forms which is not enclosed by a membrane. At this stage the majority of elementary bodies do not show a 3-layered membrane structure when the given method of fixation is used. A morphologically expressed nucleoid is also often absent. Sometimes a large group of elementary bodies and vesicles, lacking cytoplasmic contents, are arranged in a vacuole enclosed by a membrane. It is possible that the elementary bodies formed in the cytoplasm are released from the cell not only when it is lysed, but also through small defects in the cytoplasmic membrane, whose formation is not accompanied by loss of viability of the mother cell. In this case the elementary bodies maintain a connection with the mother cell for a period of time, by remaining in contact with its surface or even by joining onto it with the aid of some kind of material.

Finally, the elementary bodies can be formed from parts of the cytoplasm surrounded by myelin-like structures.

The possible modes of formation of elementary bodies and their release from the cell are the following:

1. Elementary bodies are formed by a budding process on the cell surface. The cytoplasmic membrane with the given method of fixation has a distinct 3-layered structure which we have designated conditionally as complete. On the other hand, when the 3-layered membrane structure is not evident, we use the conditional designation of "membrane undergoing formation". It should be noted that if L-forms are obtained from gram-negative bacteria, for example *Proteus vulgaris* and *Vibrio NAG*, and the mother cell is of the spheroplastic type, that is, it has a membrane consisting of the cell wall and cytoplasmic membrane, then the elementary bodies also have 2 membranes.
2. Single elementary bodies are formed from thickened sections of cytoplasm. Around them, as a result, there appears a less dense area and sometimes a membrane is formed. Elementary bodies formed in this way are clearly released from the cell through small openings in the membrane of the mother cell. The 3-layered structure of the membrane is usually not evident as long as the elementary bodies are located in the cytoplasm. When they are released from the cell, the majority of the elementary bodies have a 3-layered membrane.
3. One or many elementary bodies can be formed in a vacuole of the mother cell. Elementary bodies are released from the cell as a result of its destruction or when the wall of the vacuole becomes very thin. It is possible that this mode of formation of elementary bodies represents the final stage of the preceding mode.
4. Elementary bodies can be formed as a result of "breaking up" of the cytoplasm. Elementary bodies formed in this way are released into the environment as a result of lysis of the mother cell, and a 3-layered membrane structure may or may not be evident. The process described is characteristic primarily for early, and possibly late, stages of L-transformation.
5. Elementary bodies can be formed from sections of cytoplasm surrounded by myelin-like structures. The elementary bodies are sometimes "carried out" of

the cell by the myelin-like structures surrounding them. Therefore they can be seen outside of the cell together with the myelin-like formations.

6. There can be separation of the peripheral section of the cytoplasm from the remaining cytoplasm as a result of the growth of a membrane between them.

The ability to form elementary bodies is one of the characteristic properties of L-forms as well as mycoplasmas. It is interesting that an analogous phenomenon has been described for protoplasts and spheroplasts, as well as for the so-called L-like mutants of *E. coli*, where it is designated as internal and external budding [1]. Nevertheless, only for L-form bacteria and mycoplasmas can we consider that the role of elementary bodies as minimal reproductive elements of the culture has been proven [15, 17].

Analyzing the data on possible means for formation of elementary bodies in L-form bacteria, we should conclude that they can be formed on the surface of and inside large bodies [5, 15-18], on the surface of and inside a cell with spherical bodies [4, 20], and on the surface of filament-like structures [3]. In other words, it has been shown using various methods of electron microscopy that elementary bodies are formed in all types of cells characteristic for L-cultures, both on the surface of and inside the cell. There is, however, an opinion that the formation of elementary bodies inside the cell is an artifact of electron microscopy, as a result of which bends in the surface of the cell are thought to be elementary bodies [21, 22]. This opinion is not supported by other research and seems to us to be unlikely in the light of the material presented.

The method of the release of elementary bodies from the cell is also of interest. There is an opinion that the release of elementary bodies into the environment occurs with the lysis of large bodies or accidental injury to their membrane [15]. Utilizing the method of scanning electron microscopy and freezing and slicing, we observed a number of times the release of elementary bodies through large openings in the membrane of spherical cells as well as large bodies [3-5]. These openings are indeed characteristic for lysed cells. We can believe, however, that the release of separate elementary bodies can take place through small, temporary defects in the cytoplasmic membrane, during which the viability of the mother cell is preserved. It is unlikely that these defects can be seen in the ultrathin sections, taking into account the plastic, liquid-mosaic structure of biomembranes. Still, the close contact or even connection of many elementary bodies with the surface of the unlysed mother cells is indirect proof of the validity of our proposition.

Conclusions

1. Elementary bodies are formed on the surface of and inside all types of cells that are characteristic for L-forms.

2. The following modes have been described for formation of elementary bodies: budding on the cell surface; directly in the cytoplasm among its granular component or in a vacuole; as a result of the cytoplasm "breaking up", which is accompanied by destruction of the cell; and separation of a peripheral section of the cytoplasm by the membrane.

3. Release of elementary bodies from the cell takes place as a result of destruction and death of the mother cell, thinning of the wall of the vacuole containing the elementary bodies, and possibly through temporary small defects in the membrane which do not cause destruction of the mother cell.

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CSO: 1840/377

UDC: 616.98:578.832.1]-036.21(47+57)

SPECIFICS OF INFLUENZA A AND B PROPAGATION IN VARIOUS GEOGRAPHIC REGIONS OF THE USSR

Moscow VOPROSY VIRUSOLOGII in Russian No 1, Jan-Feb 83
(manuscript received 26 Mar 82) pp 32-36

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[Abstract] Results are presented from comparative analysis of the frequency of laboratory-confirmed cases of influenza A and B in four cities in various geographic zones. The study is based on influenza morbidity data and data from laboratory confirmation of influenza and acute respiratory illness over 5 years (1977-1981) in Murmansk, Tashkent, Simferopol' and Kemerovo. Systematic analysis of the frequency of laboratory-confirmed A and B influenza notes that intensity of influenza outbreaks may differ for the different varieties in different cities connected by heavy transportation flows. The disproportion in intensity and time of outbreaks is so great that the authors doubt that influenza A and B viruses alone are responsible for epidemic acute respiratory disease outbreaks in December of 1979-1980. An index characterizing the increase in laboratory-confirmed influenza cases should be added to the existing influenza epidemic development prediction system. Figure 1; references 16: 12 Russian, 4 Western.

[702-6508]

UDC: 618.1+616.64]-02:578.825.11]-076.4

ULTRASTRUCTURAL DESCRIPTION OF RECURRENT INFECTION FOCUS IN GENITAL HERPES PATIENTS (CLINICAL AND ELECTRON MICROSCOPE STUDIES)

Moscow VOPROSY VIRUSOLOGII in Russian No 1, Jan-Feb 83
(manuscript received 17 Apr 82) pp 91-96

KALAMKARYAN, A. A., DELEKTORSKIY, V. V., GREBENYUK, V. N., MASYUKOVA, S. A. and ZAKHALEVA, V. A.

[Abstract] The task of this work was to study the interaction of the herpes simplex virus with epidermal, lymphoid and macrophage cells in the active

stage of genital herpes. Twenty patients (16 males and 4 females) with recurrent genital herpes were the subjects. Electron microscope studies of microbiopsy materials were used to determine the ultrastructural specifics of certain immune skin cells containing herpes simplex virus. The viral ultra-structure was found to vary with the course of the disease. In patients with relatively quiescent genital herpes, capsids and nucleocapsids of the virus were found (in mature forms), which are not highly infectious. In patients with more severe and frequently recurring herpes, mature, noncellular forms of the virus were found, which are reported to be highly contagious. Phagocytosis of herpes simplex virus by neutrophyl leucocytes was complete. The phagocytic function of the macrophages was one of isolating the viruses in the cell's cytoplasm, which may produce conditions for intracellular persistance of the virus. Figures 2; references 29: 6 Russian, 23 Western. [702-6508]

UDC: 578.826:578.245

LASSA VIRUS AUTOINTERFERENCE ACTIVITY

Moscow VOPROSY VIRUSOLOGII in Russian No 1, Jan-Feb 83
(manuscript received 20 May 82) pp 96-101

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[Abstract] The method of serial successive passages of lassa virus through an undiluted culture fluid of infected cell's was used to enrich the initial viral population in defective interfering particles. The interfering activity of Vero cells chronically infected with lassa virus and the viral particles obtained by successive passages were studied. The curve illustrating the variation in infectious virus titer in the medium depended both on the virus used and on the cell line used for passage. This confirms the role of cell factors in the generation of defective interference particles. The importance of defective interference particles for chronic infection of cells with arena viruses is confirmed. Figures 4; references 15: 3 Russian, 12 Western. [702-6508]

UDC: 616.98:578.8[(47+57-17)]:001.8

VIROLOGIC ASPECTS OF THE LONG TERM RESEARCH PROGRAM "NORTH--HUMAN ECOLOGY OF THE FAR NORTH"

Moscow VOPROSY VIRUSOLOGII in Russian No 1, Jan-Feb 83
(manuscript received 29 Apr 82) pp 105-111

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[Abstract] Problems of viral infection prophylaxis in the far north require fundamental development of studies of the ecology of the man-virus system under these conditions. The man-virus system must be studied as one component of the biocenosis and biogeocenosis. The epidemiology of infectious diseases must be understood as the ecology of the pathogens which cause the diseases within human hosts. The natural chemical environment related to the geo-chemical mosaic of soil-forming rocks and soils with rhythmic seasonal and daily variations in the rate of migration of chemical elements is a very important ecologic factor. The ecologic factors of the north significantly influence the reactivity of the human organism. The immune reactivity of young persons 18 to 30 years of age in the far north corresponds to that of 60 to 80 year old persons in temperate regions. Problems of virology in the far north must be solved considering the man-virus system ecology. Only a combined, systems approach can be successful. References 26: 21 Russian, 5 Western.

[702-6508]

UDC 617-001.17-082.4-07:[613.155:579.841.92]-078

ACINETOBACTER CALCOACETICUS BACTERIA IN BURNS-TREATMENT CENTERS

Moscow GIGIYENA I SANITARIYA in Russian No 2, Feb 83
(manuscript received 1 Jul 82) pp 75-76

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[Abstract] In view of the increase in the number of reports on complications due to *Acinetobacter calcoaceticus* in burns-treatment centers, investigations were undertaken on the prevalence of this bacterium in that type of a hospital setting to determine some of its ecologic features. The incidence of positive cultures obtained from various objects (moist and dry), air, and medical personnel (hands) ranged from 15 to 52.9% (hands). Strains isolated in a hospital show multiple drug resistance (6 antibiotics and furagin [sic]). Antibiotics found most effective against the hospital strains are tobramycin, polymyxin, carbenicillin, gentamicin, erythromycin, neomycin, tetracycline, monomycin, and dioxidine. References 14: 2 Russian, 12 Western.
[364-12172]

GANGLIOSIDES AS SPECIFIC RECEPTORS FOR INFLUENZA VIRUS

Moscow VOPROSY VIRUSOLOGII in Russian No 6, Nov-Dec 82
(manuscript received 20 Apr 82) pp 661-666

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[Abstract] A study was made of gangliosides as receptors of influenza virus in chick fibroblasts treated to destroy all natural receptors, and using $^{3\text{H}}$ -uridine-labeled virus. GT1b ganglioside was found in the chick fibroblast culture 30 minutes after the start of incubation; about $3 \cdot 10^8$ ganglioside molecules were associated with each cell. GD1a and GT1b restored 60-70% of viral adsorption in the treated chick fibroblasts. GT1b facilitated transport of viral structures into the cell nucleus at a level 1.5 times greater than controls; transport associated with GT1a fluctuated widely. GT1b also restored viral ability to hemolysis. It is concluded that GT1a and GT1b are able to act as influenza virus receptors in chick fibroblasts in which natural receptors have been destroyed. The question of whether only the gangliosides or both gangliosides and glucoproteins participate in specific receptor activity remains open; findings are discussed within this context. Figures 2; references 18: 3 Russian, 15 Western.

[379-9642]

ETIOLOGY OF KARELIAN FEVER, A NEW ARBOVIRUS INFECTION

Moscow VOPROSY VIRUSOLOGII in Russian No 6, Nov-Dec 82
(manuscript received 1 Jul 82) pp 690-692

L'VOV, D. K., SKVORTSOVA, T. M., KONDRAZHINA, N. G., BERSHINSKIY, B. V.,
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[Abstract] Preliminary findings are presented from a study of an outbreak of disease occurring in the Karelian ASSR in early fall 1981. Patients presented with moderate fever, extensive purpuric-papular rash, arthralgia

and arthritis (frequently in the knee and elbow); the onset was sudden. The disease was benign and lasted 7-14 days; followup studies 4-5 months after the disease showed that a chronic condition had developed in 13 of 29 patients. The total number of cases was about 200. Serologic studies were conducted in 5 patients with acute illness and in 24 convalescent patients. The findings indicated that the etiological agent was a togavirus with a Sindbis-type antigen structure. The epidemiological significance of this outbreak is discussed. References 18: 7 Russian, 11 Western.
[379-9642]

UDC 615.371: 578.833.27]: 612.017.1

IMMUNE STATUS OF INDIVIDUALS IMMUNIZED WITH VARIOUS TYPES OF INACTIVATED VACCINE AGAINST TICK-BORNE ENCEPHALITIS

Moscow VOPROSY VIRUSOLOGII in Russian No 6, Nov-Dec 82
(manuscript received 16 Feb 81) pp 696-701

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[Abstract] A comparative study was made of the immune status of volunteers immunized against tick-borne encephalitis (Russian spring-summer encephalitis) with purified, concentrated vaccine grown in a chick embryo fibroblast culture or with commercial, nonconcentrated vaccine. Immune status was determined from serologic and hematologic tests and the serum immunoglobulins. The findings indicated no correlation between cell and humoral immunity. At 14 and 30 days after a single immunization with the concentrated vaccine, virus-neutralizing activity was not associated with IgM antibodies. In a triple administration of the two vaccines no pattern was discernible in changes in lymphocyte response; no differences were found between subjects immunized with different vaccines; no change was recorded in the IgM, IgG or IgA concentrations. Concentrated vaccine produced a high immune response. At 4-6 months after immunization with the concentrated vaccine no antibodies were found in 50% of seropositive subjects. The usefulness of various immunologic values in determining the effectiveness of concentrated vaccine is discussed. Figures 2; references 17: 8 Russian, 9 Western.
[379-9642]

STUDY OF UNTYPED STRAINS OF HERPES SIMPLEX VIRUS. DNA ANALYSIS

Moscow VOPROSY VIRUSOLOGII in Russian No 6, Nov-Dec 82
(manuscript received 11 Feb 82) pp 714-720

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[Abstract] An attempt was made to type five untyped ("intermediate") strains of herpes simplex virus (HSV) (NB, IT, RT, SM, IAM) simultaneously possessing the properties of HSV1 and HSV2 by comparative electrophoresis to analyze the DNA structure using restriction endonucleases Eco R1, Bgl II, Hin dIII and Bam H1. Electrophoretograms taken using Eco R1 showed that all strains except NB have an HSV2-type trace; Bgl II electrophoretograms indicated the same pattern. Hin dIII electrophoretograms showed a similar division into two groups but with a marked HSV2-type trace for strain SM. Bam H1 readings also divided into the same two groups, but differences were less marked. It is concluded that strain NB is an HSV1 and strains IT, RT, SM and IAM are HSV2. The findings, discussed at length, indicate that the method used is suitable for typing HSV when the results from serologic tests are ambiguous. Figures 6; references 15: 2 Russian, 13 Western.
[379-9642]

NUTRITION

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ACHIEVEMENTS OF SCIENCE AND PRACTICE OF PUBLIC HEALTH IN FIELD OF NUTRITION

Moscow VOPROSY PITANIYA in Russian No 6, Nov-Dec 82 (manuscript received 11 Aug 82) pp 3-6

Article

Text Nutrition is one of the most important social and medical factors safeguarding the population's health. Concern for a steady rise in the well-being and improvement in the health of workers and for providing them with high-quality and high-grade food products has always been in the center of attention of the party, the government and the entire public health service.

The year of the 60th anniversary of the formation of the USSR is marked by the decision of the May (1982) Plenum of the CPSU Central Committee on the "USSR Food Program for the Period Until 1990 and Measures for its Realization," which is an important landmark in the struggle of the Soviet people for the country's economic development, rise in the people's well-being and improvement in the population's nutrition, which safeguards workers' health.

From the first day of formation of the Soviet state a scientific organization of nutrition for the population was considered one of the most important problems. Suffice it to say that at the 8th Congress of the Russian Communist Party (of Bolsheviks) in 1919 the program of the Communist Party indicated that the "organization of public nutrition on a scientific and hygienic basis" was one of the main tasks in the field of public health. This principle formed the basis for all scientific and practical work in the field of nutrition.

After the Great October Socialist Revolution the provision of foodstuffs for the population became one of the most important state tasks.

The seriousness and multiplan nature of the sanitary and hygienic tasks facing the young Soviet state gave rise to the decree of the RSFSR People's Commissars "On the Republic's Sanitary Bodies," which determined the organizational forms of state sanitary supervision (15 September 1922). Subsequently, depending on the development of the food industry and the growth of the country's economy the forms of sanitary supervision also changed. For example, the authorized agents of the All-Union State Sanitary Inspectorate (1935) worked in places of concentration of food industry enterprises.

With the formation of the USSR People's Commissariat of Public Health (1936) the State Sanitary Inspectorate and, subsequently, the Main Sanitary-Epidemiological Administration with a ramified network of sanitary-epidemiological stations were under its authority and then under the authority of the USSR Ministry of Health.

The "Statute on State Sanitary Supervision in the USSR" approved by the decree dated 31 May 1973 of the USSR Council of Ministers, which determined the rights and duties of state sanitary supervision in the field of nutritional hygiene, is now in effect. The bodies of the sanitary-epidemiological service were entrusted with the tasks of improving the sanitary state of food facilities, organizing and popularizing rational nutrition and implementing hygienic and sanitary measures aimed at protecting food products from contamination and introducing scientific achievements into practice. The adoption of this decree on sanitary supervision was one of the stages in the strengthening of the organizational and legal principles of the sanitary-epidemiological service as a control body. Much attention was paid to the work of the sanitary-epidemiological service in the field of state sanitary supervision of nutritional hygiene. The sanitary service established on the basis of the indicated decree was developed further. During the years of activity of the Soviet sanitary service its material and technical base was established. The sanitary service accumulated a wealth of experience in medical supervision in all national economic fields, including in the protection of food products from contamination. For the solution of practical problems it was necessary to carry out scientific investigations. Therefore, the State Central Scientific Institute of Public Nutrition of the RSFSR People's Commissariat of Public Health, subsequently transformed into the Institute of Nutrition, was organized in Moscow in 1930.

During the first years of the Soviet regime the work of sanitation specialists was hampered owing to the absence of sanitary legislation, on the basis of which it would be possible to place specific requirements on the quality of food products and on the consideration of sanitary standards in the construction of food facilities. Subsequently, as the work of sanitary bodies as bodies of state authority was organized and strengthened, standards and rules determining the functions of sanitary supervision bodies were established.

Under the difficult conditions of 1920-1924, when chaos reigned in the country, the Soviet Government was constantly concerned with the population's nutrition. Under Prof M. N. Shaternikov's guidance nutritional standards for individual population groups were determined. Subsequently, they were refined repeatedly, that is, in 1951 (O. P. Molchanova), 1968 (A. A. Pokrovskiy) and 1982 (V. A. Shaternikov). The first domestic tables of the chemical composition of food products were established (1925-1961). The introduction of nutritional standards and of tables of the chemical composition of food products greatly facilitated the work of sanitation specialists in the organization of nutrition of the country's population on a scientific and hygienic basis.

The rules regulating the relationships between the People's Commissariat of Public Health and other departments in the field of public nutrition adopted in 1921 were an important document. At the same time, it was established that

the introduction of ever newer methods of manufacture of products must be co-ordinated without fail with the bodies of the People's Commissariat of Public Health. Public health bodies were entrusted with supervision over food products at all the stages of their manufacture, transportation and storage.

The Soviet sanitary-epidemiological service with due regard for the scientific recommendations of the Institute of Nutrition for the first time developed a method of preventive sanitary supervision. Materials of a legal nature determining the content of this work and the obligations of sanitary bodies, as well as standard materials and standards for the planning of enterprises of various industrial sectors, were developed. The following were approved only in the last few years: sanitary rules for public nutrition (1976) and meat and poultry processing (1970), baking (1969) and confectionery (1971) industry enterprises and for vessels of the fish industry in inland reservoirs of the USSR (1981), an instruction on state sanitary supervision over raw food materials and food products imported to the USSR (1982), sanitary rules concerning food additives (1978), an instruction on the procedure of conducting a hygienic expert examination of food products in the institutions of the sanitary-epidemiological service (1981) and sanitary-hygienic requirements for the utilization of duck and goose eggs, as well as chicken eggs from farms unfortunate in connection with infectious poultry diseases, for food purposes. The following were developed: standards and rules concerning the organization of sanitary supervision in the field of nutritional hygiene, in particular instructive-methodological directives on the work of sanitary-epidemiological stations in the section of nutritional hygiene (1976), "Methods of Determining Nitrosamines," "Temporary Hygienic Standards for the Content of Some Chemical Elements in Basic Food Products" (1981), a list of chemical preparations recommended for application in agriculture, methodological recommendations for the detection, identification and determination of the content of aflatoxins in food products (1981) and temporary instructions on microbiological standards for a number of highly perishable food products and on the methods of their investigation (1981).

Vitamins are a necessary element of high-grade nutrition. That is why the problem of enriching nutrition with natural and artificial vitamins has become urgent from the point of view of rational nutrition. The Institute of Nutrition of the USSR Academy of Medical Sciences developed standards of man's daily need for vitamins (1944, 1946, 1960 and 1982) and the orders of the USSR minister of health (1955-1972) introduced mandatory C-vitaminization of food in children's medical and preventive institutions, in hospitals for adults, in maternity hospitals and so forth. A number of instructive materials on extensive vitaminization of consumer goods were issued.

Prevention of food poisoning is one of the basic directions in the work of sanitation specialists on nutritional hygiene. Significant advances have been made in this field. For a clarification of the etiological role of various microorganisms overall research was conducted in the Institute of Nutrition of the USSR Academy of Medical Sciences. The results of this research formed the basis for the work of the country's sanitary-epidemiological service in this direction.

Scientific data on the toxicological effect of a number of pesticides applied in agriculture for pest control made it possible to establish their maximum permissible concentrations in food products and to objectively evaluate the degree of risk in the application of various chemical preparations in agriculture and industry. An automated system, by means of which it is possible to determine the content of residual amounts of pesticides in food products and to quite rapidly obtain accurate information on contamination, which will make it possible to take immediate measures to protect food products against contamination with pesticides, has been developed recently and is being introduced into practice.

As the food industry developed, the problem of admixtures and food additives to food products and their hygienic evaluation attracted the attention of the sanitary-epidemiological service to an ever greater extent. Special standards and rules regulating their utilization were established on the basis of widely unfolded scientific research. Lists of polymer materials allowed to be used in the food industry were developed.

The organization of control over the contamination of food products is the central link in ensuring their safety. In the last 3 years alone the Institute of Nutrition of the USSR Academy of Medical Sciences has developed a number of modern unified methods of detection, identification and quantitative determination of various foreign substances in food products approved by the USSR Ministry of Health as official. A further development of research on the standardization of a number of contaminants and on the establishment of microbiological standards for basic food products is planned.

Along with the constant improvement in the service of sanitary supervision in the field of nutrition scientific research expanded and intensified in this field. By the present time research devoted to problems of nutrition is conducted in the country's three major scientific institutions (the Institute of Nutrition of the USSR Academy of Medical Sciences, its Kazakh affiliate and the Kiev Institute of Nutritional Hygiene), as well as in the subdivisions of 70 scientific research institutions and in the departments of higher educational institutions.

During the last decade many new data characterizing the role of individual food substances in the vital activity of the organism were obtained and the effect of some alimentary factors on the structure and functional properties of biological membranes was determined. This research, as well as the study of the population's actual nutrition in the country's various regions, made it possible to carry out extensive work on the refinement of existing nutritional standards. The performance of this work was dictated by the social and economic changes that occurred in our country during the last decade, including changes in working and living conditions and the age structure of the population. As compared with the standards previously in effect (1968), the new standards are distinguished by a big differentiation according to population groups. For example, standards for children for the first year of life and for students of vocational and technical schools are singled out. The able-bodied population is divided into five groups according to the intensity of labor and into three age groups. The standards determine for the first time the needs for a number of nutrients, such as linoleic acid, folic acid and vitamins B₁₂ and E. The new physiological standards of the needs for basic food substances and energy were approved by the board of the USSR Ministry of Health on 22 March 1982.

Standards for a rational consumption of the most important food products by the population until 1990 were developed on the basis of this document. They were the initial material during the development of the basic sections of the Food Program adopted by the May (1982) Plenum of the CPSU Central Committee.

In accordance with the decisions of the party and the government in the last few years much attention has been given to the development of new food products characterized by a high biological value. This applies primarily to baby food products ("Malysh" and "Malyutka"--dry and liquid; "Biolakt," "Baldyrgan," "Ladushka," "Vitalakt," "Detolakt" and so forth), dietetic products (dietetic mayonnaise, dietetic low-calorie margarine, "Zdorov'ye" sour cream, melted cheeses of a high food value and protein-free products) and specialized products for athletes.

The development of new specialized therapeutic products--"enpity"--intended for the tube feeding of serious patients is an important result of scientific research. This product is being widely introduced into the therapeutic practice of clinical institutions.

Large-scale work has been done on the development of pathogenetically substantiated therapeutic rations for patients suffering from diffuse chronic internal diseases (alimentary obesity, peptic ulcer, chronic renal insufficiency and so forth).

In connection with the problem of children's nutrition work is directed toward the rationalization of the nutrition of children attending preschool institutions and extended-day schools, as well as students of vocational and technical schools. Much attention is paid to the nutrition of young children and to the feeding of prematurely born babies. Problems of children's therapeutic nutrition are being worked out intensively.

The publication of two volumes of tables of the chemical composition of food products (1976 and 1979) is one of the most important results of recent years. The preparation of the third volume of tables, which summed up information on the chemical composition of prepared dishes and culinary products, was completed in 1981. Large-scale work was done on the unification of quantitative methods of analysis of the chemical composition of food including the determination of amino acid, fatty acid, vitamin and mineral compositions.

Research aimed at finding new sources of food substances, primarily protein, is of great importance. Research in this direction is expanding constantly. A number of potential sources of protein of plant origin (soybeans, sunflower seed meal, tomato seeds and so forth), as well as new fishing objects from the world ocean and inland reservoirs, were subjected to a medicobiological evaluation. Systematic medicobiological research on the evaluation of the possibilities of utilization of various biomasses from unicellular organisms as a feed additive continues. The production of this feed additive now provides a substantial part of the feed base of animal husbandry.

Tremendous advances in the cause of protection of the population's health were made during 60 years of existence of the USSR. They made it possible to increase the life span and to reduce the mortality of the juvenile and adult population and to eliminate conditions promoting the development of diseases. The introduction of the achievements of the science of nutrition into the practice of public health plays an important role in this.

There is no doubt that, subsequently, the solution of problems in the field of nutrition will also be ensured by the joint labor of scientists, as well as physicians and specialists in nutritional hygiene of the ministries of health of the USSR and of all the Union republics.

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RESULTS OF DEVELOPMENT OF SCIENCE OF NUTRITION IN KAZAKHSTAN DURING 60 YEARS OF EXISTENCE OF USSR

Moscow VOPROSY PITANIYA in Russian No 6, Nov-Dec 82 (manuscript received 11 Aug 82) pp 7-12

/Article by T. Sh. Sharmanov, Kazakh Affiliate of the Institute of Nutrition of the USSR Academy of Medical Sciences, Alma-Ata/

/Text/ The nature of nutrition of a country's people is one of the main indicators determining the level of its well-being. During 60 years of existence of the USSR, owing to the constant concern of the Communist Party and the Soviet Government, the nutrition of the Soviet people underwent fundamental changes and improved significantly. During the planning and implementation of extensive health-improvement measures the Soviet State has always paid much attention to problems of nutrition as an indispensable condition for a harmonious development of its citizens and for nonspecific prevention of many diseases. The advances made are known all over the world. The changes that have occurred in Kazakhstan--in the past one of the most backward outlying districts of tsarist Russia--are especially impressive. The first scientific research on the population's nutrition conducted in this region /1/ disclosed that poor nutrition and systematic malnutrition of the bulk of the Kazakh people brought about by social inequality in the distribution of food products were some of the main causes of the high morbidity, mortality and lag in the physical development of the natives during the prerevolutionary time.

Owing to the Leninist national policy of our state, during a brief historical period Kazakhstan was transformed into a republic with a highly developed industry, agriculture, science and culture. The structure of the people's nutrition improved fundamentally. Owing to this, mass typhus, trachoma and avitaminosis diseases and other serious alimentary disturbances connected with unsatisfactory social and domestic conditions and nutrition became past history. The physical development and other health indicators of the republic's population improved.

However, systematic research on medical problems of nutrition begun in Kazakhstan after the establishment of the department for nutritional hygiene in the Scientific Research Institute of Regional Pathology of the Kazakh SSR Ministry of Health in 1962 has shown that a number of deviations from physiological norms occur in the nutrition of the population in individual rayons in this region of the country. The unfavorable geographic conditions on a big territory in the republic and the weak development of vegetable growing and orchard

cultivation connected with them brought about a certain uniformity in the food ration of individual population groups, a predominance of starch and groats dishes and in some cases an insufficient consumption of animal protein and vitamins, especially ascorbic acid and retinol. Data characterizing the connection of the population's health and diseases with nutritional characteristics were obtained. It has been shown that the degree of provision of the organism with complete protein and vitamin C has a big effect on resistance to infection. A deficiency of these substances brings about an atypical course of chronic infectious diseases (brucellosis and tuberculosis) with a significant depression of immunological reactions. The effect of the imbalance in the food ration on the need of the organism for some nutrients (vitamins A, C and B₂, trace elements and so forth), on a number of physiologobiochemical characteristics of the organism, on the state of the nervous, blood-forming and vascular systems, on specific and nonspecific immunological reactivity, on the rates of physical development of children and adolescents and so forth was revealed /2-8/.

A number of recommendations aimed at the rationalization of nutrition and improvement in the health of certain population groups in the republic were developed and introduced into the practice of public health.

The further growth of scientific personnel--nutriologists--in the republic and the organization of the Kazakh affiliate of the Institute of Nutrition of the USSR Academy of Medical Sciences made it possible to expand and intensify the front of research on medical problems of nutrition. At the same time, Kazakhstan's nutriologists directed their attention toward the ultimate goal of the science of nutrition--the development of scientific principles of nutrition for the healthy and sick person and the rationalization of the population's nutrition as applied to age, sex, physiological, occupational and other characteristics. The attainment of this goal is possible only with the combination of applied and fundamental research aimed at the further development of A. A. Pokrovskiy's concept of balanced nutrition /9/--basic in modern nutrition. Our own experience and the experience of other researchers convinced us that the development of this concept could not proceed in an abstract way, without taking the effect of numerous environmental factors on the organism into consideration, in particular occupational hazards, stress situations of natural and social genesis, contamination of food products with foreign substances, decrease in the population's physical activity and so forth. It followed from this experience that the development of the theoretical and applied aspects of this concept was impossible without an all-around and in-depth study of actual nutrition subjected to a certain dynamics or without a study of the dissemination of the forms of the food imbalance and their effect on the population's health.

Important aspects of hygiene and of therapeutic and children's nutrition, as well as fundamental problems in the biochemistry and physiology of nutrition, were studied from these positions.

Research on actual nutrition and on the ways of its rationalization among various population groups, primarily children and industrial and agricultural workers, development of new food products for young children and study of the chemical composition nutritive and biological value of national food products, as well as of problems connected with the contamination of food products with xenobiotics (pesticides, mycotoxins and nitrosamines) and microbiological agents, predominated among hygienic investigations /10-12/.

The dietological aspect of this research is represented by investigations devoted to the study of the therapeutic properties of national dairy and meat products and to the development of diets for the treatment of patients with chronic diseases of digestive organs and with metabolic-alimentary obesity /8 and 13/.

Fundamental research was aimed at the study of the biological effects of forms of alimentary disturbances most widespread in real life, urgent issues of the problem of assimilation and dissimilation of food substances under conditions of unbalanced nutrition, the effect of toxic agents and extreme conditions (xenobiotics, occupational hazards, high mountains and hypokinesia) and, in particular, the problem of internutrient relationships in the organism against the indicated background /14-18/. The overall nature of research on an intra- and inter-institute scale was widely practised in the process of planning and performance of work. Such an approach to the solution of scientific problems was further developed in the "Program for Overall Research on the Population's Actual Nutrition, Development of Basic Principles in Its Rationalization and Provision of the Maximum Adaptive Protective and Therapeutic Role of Food Under Conditions of the Combined Effect of Negative Environmental Factors on the Organism" designed for the period until 1990, which was worked out by the affiliate. The program envisages an overall participation in the fulfillment of the scientific subjects of all the laboratories of this affiliate, as well as of the scientific subdivisions of a number of medical higher educational institutions and scientific research institutes of Kazakhstan, Moscow, Leningrad, Tashkent and other cities in the country.

Owing to this, a number of theoretically and practically important results were obtained during a comparatively short period.

A hygienic description of the actual nutrition and state of health of Kazakhstan's population was given and the present energy expenditures of workers in key sectors of the republic's industry were refined. The population's actual nutrition under high-mountain conditions was studied and scientific approaches to the utilization of the adaptive properties of food under these conditions were refined.

Average per-capita standards of consumption of basic types of food products in the Kazakh SSR until 1990 differentiated in terms of oblasts were developed. They were approved by the republic's State Planning Committee for their utilization during the development of the food program for the period until 1990.

The most widespread forms of alimentary disbalances in Kazakhstan were established. Adequate experimental models of these disturbances making it possible to study the biological and clinical effects of the latter in detail were developed.

Important aspects of protein-vitamin relations in the process of metabolism, including against the background of unbalanced nutrition, were disclosed. It was established that prolonged consumption of rations incomplete in some component led to the development of the syndrome of polynutrient insufficiency. An analysis of the results of this research made it possible to formulate the

thesis on imbalanced forms of protein and vitamin insufficiency. Protein-deficient forms of endogenic hypovitaminosis D and C and the development of secondary protein insufficiency under conditions of a deficiency of retinol, thiamine, riboflavin and pyridoxine in nutrition can serve as an example 14.

Significant, new aspects of the etiology and pathogenesis of rickets were disclosed. In particular, the possibility of an imbalanced form of rickets developing with a sufficient provision of the organism with vitamin D combined with a deficiency of some irreplaceable amino acids (lysine, threonine and thionine) and other vitamins (A and group B) was demonstrated. A disturbance in phosphorus-calcium metabolism with such a disbalance in the food ration is connected in large measure with a change in the chemical composition of membranes of the brush border of intestinal epitheliocytes, of the sarcoplasmatic reticulum of muscles and of liver and kidney cells 18 and 19. At present these data are taken into consideration by specialists in the prevention and treatment of rickets.

These results were also taken into consideration during the development of "Baldyrgan" and "Balbobek," new lactic acid baby products, and of a dry and liquid multicomponent additive for enrichment and correction of cow's milk for the purpose of its adaptation to the physiological needs of young children 10 and 11. These products are widely used in the nutrition of healthy and sick children in the republic and beyond its borders.

The study of the interconnection between the metabolism of nutrients from the point of view of the maintenance of the homeostasis of the basic energy material--glucose--is an interesting aspect of the development of the concept of balanced nutrition. Such an interconnection is manifested at the level of the alanine cycle, which coordinates the utilization of glucose with protein metabolism, on the one hand, and lipolysis with gluconeogenesis, on the other. In our experiments on animals and in clinical observations it was established that, when there is a change in the need for energy (physical load or hypokinesia), or when there is a disturbance in its assimilation (obesity or diabetes), significant characteristics are manifested in the nature of the interconnection of nutrients in the alanine cycle, which to one degree or another it is possible to correct by the selection of certain correlations in the diet of proteins, fats and carbohydrates, or by the introduction of their metabolites. It has been shown that, if the content of protein in the food ration is insufficient qualitatively and quantitatively, the tolerance of the organism for glucose is lowered and processes of lipogenesis brought about by a decline in the level of formation and utilization of alanine predominate 20 and 21.

During a detailed study by the affiliate's associates of the structural and functional state of cellular and subcellular membranes of various organs their distinctive dependence on the nature of nutrition and on the effect of xenobiotics, hypokinesia, hypoxia and other factors was disclosed. These data can be utilized in an experiment during the solution of the problem of the degree of balance of specific forms of nutrition and of their adaptogenic and protective properties.

In this respect investigations of the laws of the peroxide oxidation of lipids, of systems of enzymatic and nonenzymatic regulation of peroxidation of phosphatides of membranes and of the active energy-dependent transport of cations in cell membranes deserve attention. They made it possible to disclose individual mechanisms characterizing the dynamics of peroxide oxidation of lipids and changes in the provision of the organism with vitamins A, E, C, B₂ and PP in the process of adaptation of man and animals to high mountain conditions against a different nutrition background and on this basis to make a correction in the food ration of the corresponding population group.

As a result of the research conducted by the affiliate's associates certain regular interconnections between the endoplasmatic reticulum of hepatocytes, the quantitative and qualitative composition of the bile and the complex of blood lipoproteins functioning as a single self-regulating system were detected. It should be stressed that the latter reveals a distinct dependence on the nature of nutrition and on the effect of xenobiotics. Apparently, the state of the indicated system can also be utilized as one of the tests of the evaluation of the balance of nutrition and its protective function. Furthermore, taking into consideration the detected lability of components of the examined system during alimentary, toxic and, perhaps, other exogenic effects, it should be assumed that their further overall study will contribute to the decoding of the mechanisms of development of atherosclerosis and other widespread diseases of the cardiovascular system and will create new prerequisites for a purposeful construction of therapeutic and preventive diets.

In terms of the rationalization of nutrition an evaluation of the nature of the relationship between food and the immune system of the organism is also important. Many investigators interpret the penetration of food, in particular protein, macromolecules from the intestine to the blood flow as an exception to the rules of the barrier function of the mucous membrane. However, we allow for the possibility that the absorption of food antigens is a normal, necessary and, apparently, physiologically controlled phenomenon. In this connection ordinary consumption of diverse protein, polyssacharide, lipid and other natural complexes is not only important in terms of food, but, perhaps, in terms of the immunological stimulus ensuring the maintenance of the necessary tone of the immune system. In an experiment we disclosed important conditions for the development of immunological tolerance and sensibilization to such food protein as the protein of a chicken egg and ovalbumin. When they were fed to sexually mature guinea pigs, sensitization developed, which during the subsequent parenteral administration of the same antigens was manifested by an anaphylactic shock. At the same time, when this protein was fed to newborn guinea pigs, persistent tolerance for it developed. Hypersensitivity was induced only in newborn guinea pigs obtained from mothers sensitized to this protein. Obviously, here we deal with a vertical transmission of heightened sensitivity to protein, whose ways will still have to be clarified. The disclosed patterns in the development of sensitization and tolerance for food protein point to the need for the further development of immunological principles of evaluation of the adequacy of nutrition, primarily the nutrition of young children /22 and 23/.

An important place in the research by Kazakhstan nutriologists is assigned to the study of the chemical composition, food and biological value and therapeutic properties of national products (mare's and camel's milk, kumiss and "shubat"). Diets with an inclusion of these products for the treatment of patients with chronic diseases of digestive organs (peptic ulcer of the stomach and the duodenum, chronic gastritis, enterocolitis and hepatitis) and with metabolic alimentary obesity have been developed and are used in general health and sanatorium-health resort institutions of Kazakhstan [13].

The affiliate's associates studied the chemical composition and the food and biological value of flour from tomato seeds and of the protein isolate from this flour. The advisability of the utilization of flour as a new food source capable of serving as an adequate substitute of 1 to 7 percent of wheat flour during the baking of bread and of bread and flour products without changing the palatability of the latter was demonstrated. It was established that the protein isolate from tomato seeds characterized by a good correlation of essential amino acids was suitable for the enrichment of the same products with protein.

The contamination of food products with pesticides, organomercuric compounds, nitrosamines, toxicogenic microscopic fungi and their metabolites was studied in a number of large regions in Kazakhstan. The contamination of some regions and products with individual xenobiotics was characterized as potentially dangerous, which was the basis for the development of additional measures for the protection of food products and their introduction into the practice of the republic's sanitary-epidemiological service [12, 16 and 17].

The modifying role of some factors in nutrition (essential amino acids--lysine, methionine, threonine and vitamin A) in the manifestations of the carcinogenic effects of N-nitrosopiperidine and aflatoxin B₁ has been established. The decoding of the mechanisms of this effect can be of significance in terms of the further intensification of the existing idea of carcinogenesis [16 and 17].

Thus, Kazakhstan's nutriologists obtained systematized information on the actual nutrition of the republic's population and on the widespread forms of alimentary disturbances. New data on the characteristics of the reaction of the organism with these food disbalances under conditions of an additional effect of other negative environmental factors (xenobiotics, hypokinesia, high mountains and hypoxia) on the organism were obtained. Existing ideas of internutrient interrelations in the process of metabolism in connection with the quality of nutrition were intensified and previously unknown immunological aspects of nutrition were disclosed. Certain advances in the elaboration of problems of the therapeutic application of some national products were made and more physiological, new baby products were developed. Important steps were made in the elaboration of the problem of foreign substances contaminating food products. On the whole, all this is a definite contribution to the development of the concept of balanced nutrition, which, like any other real concept or theory, is dynamic in its very essence in connection with the dynamic nature of the phenomena reflected by it.

Our time is characterized by a sharp intensification of the attention to the problem of nutrition, which is brought about by the growing acuteness of its economic, social and medical aspects, in particular by the determining effect of nutritional factors on the population's health, by the shortage of food resources, primarily protein sources, in the world and, especially, in developing countries and by the existence of the fundamental possibility of regulation of the food structure on the basis of the conclusions of the science of nutrition and its practical recommendations. The significance of this problem and the determination of the ways of its further elaboration acquire a special meaning in the light of the USSR Food Program for the Period Until 1990 adopted by the May (1982) Plenum of the CPSU Central Committee. Therefore, intensification of research by the Kazakh Affiliate of the Institute of Nutrition of the USSR Academy of Medical Sciences and by the republic's institutions coordinated by it on a number of important trends in the science of nutrition reflected in the above-indicated overall program of this affiliate is envisaged during the current five-year plan.

A number of studies are devoted to an investigation of the state of health of workers in the key sectors of the republic's chemical industry (phosphorus, chrome and other sectors) in connection with actual nutrition, energy expenditures and industrial hazards for the purpose of development of scientifically substantiated rations of preventive and therapeutic nutrition.

The problem of man's nutrition under extreme conditions (high mountains, desert, sport, hypokinesia and hypoxia), which is becoming ever more acute every year, is being worked out intensively.

Much attention is paid to the further optimization of baby products through their enrichment with biologically active and protective factors and development of new products and rations for therapeutic and preventive purposes.

An intensive study of the problem of contamination of food products with foreign chemical and biological agents (pesticides, nitrosamines, mycotoxins and microorganisms) is carried out and measures to ensure the safety of products and methods of control are developed.

Considerable attention is paid to the further elaboration of the problem of assimilation of food substances and to the clarification of the mechanisms of internutrient relations in the process of metabolism under the effect of a set of negative environmental factors and occupational hazards on the organism previously established in the affiliate. This research will be of significance for a scientific substantiation of the utilization of individual food factors and for their combination with the preventive and therapeutic purpose, as well as for an improvement in the adaptation of man's organism to extreme conditions.

Substantial forces and funds are concentrated on an investigation of the problem of utilization of protein from cotton seeds in nutrition, which is of great national economic importance.

Thus, the research on medical problems of nutrition conducted and planned for the 11th Five-Year Plan in Kazakhstan is directed toward the realization of the tasks set by the 26th CPSU Congress for national public health, as well as toward the solution of the hygienic aspects of the USSR Food Program.

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ACHIEVEMENTS OF SCIENCE AND PRACTICE IN FIELD OF NUTRITION IN GEORGIAN SSR
DURING 60 YEARS OF EXISTENCE OF SOVIET UNION

Moscow VOPROSY PITANIYA in Russian No 6, Nov-Dec 82 (manuscript received 27
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/Article by G. V. Abdushelishvili, Scientific Research Institute of Sanitation
and Hygiene imeni G. M. Natadze of the Georgian SSR Ministry of Health/

/Text/ The Georgian Republic, celebrating, together with the fraternal nations
of the Soviet Union, the famous anniversary--60 years of the formation of the
Union of Soviet Socialist Republics--is proud of its achievements in all the
fields of science.

From the day of formation of the Soviet State the party and the government
have been tirelessly concerned with the health of our people. This concern
was also reflected in the program of the 26th CPSU Congress, which stressed
the preventive direction in Soviet public health. Owing to the daily concern
of the party and the government hygienic science and sanitary practice in our
republic gained greatly in scope. Whereas before the establishment of the
Soviet regime there was not a single sanitary-epidemiological institution in
Georgia, at present 90 sanitary-epidemiological stations, two scientific re-
search institutes of hygienic specialization, departments of hygiene of the
Tbilisi Medical Institute and the State Institute for the Advanced Training
of Physicians imeni S. M. Kirov with 7,000 medical workers serve the cause
of health protection for the population in the Georgian SSR.

Only one Tbilisi city laboratory engaged in problems of investigation of food
products and drinking water existed in Georgia during the first years of the
Soviet regime. To solve the problems facing sanitation specialists and pub-
lic health organs during the initial period of formation of Soviet public
health, it was necessary to conduct scientific research. In connection with
this in 1926 the existing city laboratory of food products and drinking water
was reorganized into the Institute of the Tbilisi City Public Health Division
renamed in 1936 the Scientific Research Institute of Sanitation and Hygiene.
Systematic scientific research and the training of specialists in the field
of hygiene were conducted in the division of nutrition of this institute.

The laboratory of nutrition of the Georgian SSR Ministry of Health founded in
1934 by Prof G. S. Vatsadze dealt with problems of nutritional hygiene. Work
on the detection of vitamin resources for the republic's food industry was

carried out in this laboratory under the guidance of G. M. Natadze, corresponding member of the USSR Academy of Medical Sciences. The first serious scientific research in the field of nutritional hygiene is connected with the name of G. M. Natadze, founder of vitaminology in Georgia. He organized the first expeditions in the republic for the purpose of studying the nutrition of the rural population, in which, in addition to the laboratory's associates, leading scientists of our country--V. V. Yefremov, O. P. Molchanova and other associates of the Institute of Nutrition of the USSR Academy of Medical Sciences--participated.

The creative contacts with the Institute of Nutrition of the USSR Academy of Medical Sciences and with scientific institutions in fraternal Union republics established by G. M. Natadze have been expanding and growing stronger to this day.

In the last few years the activity of Georgia's hygienists has been directed toward the development of major overall research for the purpose of solving important national economic problems. An overall medical study of the actual nutrition and health of the rural population in some regions in the republic with due regard for the climatogeographical characteristics and occupational load of the studied group has been conducted for 7 years. The detection of the degree of balance of irreplaceable food components, as well as of the population's health, has been the object of this study.

Research has shown that the nutrition of our republic's population, as well as of the population of the entire Soviet Union, is characterized by a sufficient caloric value. However, the qualitative composition of the daily ration of the rural population does not yet fully meet the requirements of balanced nutrition. The detected qualitative imbalance in the daily ration of rural residents in individual regions gave cause for the development of the recommended set of products in the daily ration of rural residents according to occupational groups (viticulturists, tea growers, livestock breeders and so forth).

The results of long-term expedition work on the study of the population's actual nutrition and state of health served as the basis during the development of measures and hygienic recommendations approved by the Georgian SSR Ministry of Health aimed at the rationalization of nutrition of Georgia's population.

During the study of the population's state of health special attention was paid to diseases connected primarily with disturbances in nutrition, in the first place to alimentary obesity. An increase in the number of individuals with excess weight was revealed and some disturbances in the population's state of health closely connected with the nature of nutrition in this locality were established. The percent of persons with obesity and excess body weight in the republic was detected, the causes of its prevalence were established and preventive measures for its reduction were developed. Hygienic recommendations were established.

In the republic much attention is paid to problems of dietetic nutrition. Studies in this field have shown that the utilization of national dishes in the dietetic nutrition of patients often is more effective than the utilization of therapeutic dishes. The development of therapeutic diets for patients suffering from obesity and gastrointestinal diseases, which continued for a number of years, has been completed.

In connection with the introduction of various chemical substances into agriculture the problem of protection of products of agricultural production from contamination with pesticides has become urgent. A toxicological evaluation of a number of toxic chemicals applied in agriculture has been made systematically in Georgia. As a result of the conducted toxicological and hygienic research, standards of permissible residual quantities of pesticides in food products (phosphamide, kelthane, captan, phthalan, morocide, primor, topsyn-M and so forth) and of maximum permissible concentrations in water and reservoirs (captan, phthalan, morocide, primor and so forth) were developed. The indicated standards were approved by special commissions and were included in USSR legislation on the application of pesticides.

As is well known, the chemical composition of food products is not constant and often depends on climatogeographic conditions. In connection with this the study of the chemical composition of food products in various regions with due regard for climatogeographic conditions acquires great importance. The chemical composition of food products of local origin is studied on the basis of the recommendations of the head institute in various regions in our country, including in our republic.

Work on the establishment of the vitamin status of healthy and sick people occupies an important place in research. Material on the provision of the basic groups of Georgia's population with vitamins was prepared. It was included in the report "On the Provision of the Basic Groups of the USSR Population With Vitamins."

Intensive research is conducted by our specialists on the search for new sources of food protein.

Specific work on ensuring the fulfillment of the decree dated 19 April 1974 of the CPSU Central Committee and the USSR Council of Ministers "On the Further Development of the Production of Food Products for Children" was done in the Georgian SSR in the last few years. New types of products for children were developed. The demand for and consumption of food products for children among children under the age of 1 year and 1 to 6 years old were studied. New mixtures for feeding infants were developed. A reference book on the nutrition of the healthy baby and preschool age children with due regard for dietetic nutrition was prepared.

The results of research in the field of nutritional hygiene are widely presented at scientific conferences, meetings, symposiums and international and world congresses.

Special significance is attached to the popularization of the results of scientific research among wide strata of the republic's population. Works concerning urgent problems of nutrition are published.

Extensive work is carried out at the departments of nutritional and general hygiene of the Tbilisi Medical Institute for the Training of Personnel of Sanitation Specialists--future specialists in the field of nutritional hygiene. The department's associates published textbooks and manuals for students and physicians working in the field of nutritional hygiene.

Georgian specialists working in the field of nutritional hygiene will continue to work intensively for the further development of the science of nutrition in order to make their contribution to the cause of strengthening the health of the republic's population.

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WAYS OF INCREASING BIOLOGICAL VALUE OF PLANT PROTEIN

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Article by V. A. Shaternikov, V. G. Vysotskiy, T. A. Yatsyshina, A. K. Batyrin and A. M. Safronova, Institute of Nutrition of the USSR Academy of Medical Sciences, Moscow

Text Meeting man's needs for protein is a very important problem of the present time. Intensification of agricultural and other traditional methods of production of protein containing products can no longer serve as the only method of solving it. The search for ways of the most efficient utilization of new sources of protein through their rational distribution for food and feed purposes is now considered a significant potential for the replenishment of the protein stock 1-5. At the same time, an increase in the amount of protein alone without a parallel consideration of its biological value cannot be considered economically justified. Therefore, the criterion of biological value, along with other technical and economic indicators, undoubtedly, should be taken into consideration during the evaluation of the profitability of production of food and feed protein. This criterion acquires especially great importance in connection with protein of plant origin irrespective of whether this protein forms part of traditional food products, or is obtained in an isolated form from secondary raw materials for a subsequent food utilization.

Such a formulation of this problem is due to three reasons. First, grain crops provide 50 percent of the world output of protein, leguminous crops, 20 percent and livestock and fish products, 30 percent. In developing countries the quota of the protein of grain crops increases to 70 percent with a corresponding decrease in the share of the protein of leguminous crops and, especially, of the protein of animal origin 6. Second, the waste of the processing of agricultural raw materials is one of the most important and largest-scale sources of additional protein 4 and 6-8. Third, all plant protein without exception is limited in certain essential amino acids [9-12]. Thus taking into consideration the volume of production of plant protein, its balance in man's nutrition and its qualitative description, it should be noted that an increase in the biological value of this protein plays a special role in the plan for an increase in the resources of food protein.

There are four fundamentally different ways of increasing the value of plant protein.

The first way is connected with the bioconversion of plant protein into highly valuable animal protein. This created natural way, which later man used in animal husbandry, unfortunately, is an inadequately efficient method of increasing the biological value of plant protein. It has been established /4 and 13-17/ that in the production of animal products the efficiency of conversion of feed protein into animal protein ranges from 6 to 38 percent, that is, this process is associated with an average loss of three-fourths of feed protein. For example, in the production of beef conversion (in percent) comprises 6-10, of mutton, 9, of pork, 12-15, of rabbit meat, 17, of poultry, 17, of fish, 20, of milk, 23-38, of eggs, 25-31 and of broilers, 31. At the same time, it is necessary to stress that a significant part of the protein used in animal husbandry (lucerne, oil cakes and fish meal) has an amino acid composition close or equal to that of animal protein. This additionally points to the low efficiency of the method of bioconversion from the point of view of its utilization for an increase in the biological value of feed, primarily plant, protein. At the same time, if we take into consideration the established practice of obtaining vitally necessary animal protein and the evolutionarily formed taste habits and desires of people to vary food, we must admit that this way of improving the quality of low-value protein of plant origin, apparently, will remain the basic way in the visible future.

The second way of increasing biological value is connected with a directed selection of varieties of agricultural crops for the purpose of lowering the deficiency of essential amino acids limiting their protein. Until recently the main attention of selectioners has been directed toward the development of mutants of grain, oil and other crops possessing a high yield, resistance to diseases, adequacy for local conditions of cultivation and so forth /18 and 19/. Therefore, changes in the chemical composition connected with an increase in the content of protein observed in some cases have been of great, but, nevertheless, secondary importance.

However, in 1964 it was shown that in the protein of the Opaque-2 corn mutant the content of lysine and tryptophan was approximately twice as high as the usual /20-23/. After this discovery vast research on the production of similar mutants for other grain crops, primarily for wheat and rice, began, because the latter together with corn provide three-fourths of the world output of grain crops, while barley, sorghum, oats and millet comprise one-fourth /23-25/. At the same time, taking into consideration the fact that the content of protein in leguminous crops greatly exceeds the content in grain crops, in 1973 the UN Consultative Group on Protein recommended that special attention be paid to research on the production of high-methionine mutants of these crops /18/.

As a result of the conducted research on directed selection several new genotypes of corn /20-23, 26 and 27/, barley /28 and 29/ and sorghum /29/ with an increased content of lysine and protein were identified. Subsequent experiments on laboratory and farm animals confirmed an increase, sometimes significant, in the biological value of the protein of mutants (table 1), as compared with that of ordinary types of these crops /19, 23, 28, 29 and 30-34/. The favorable effect of high-lysine corn in the treatment of kwashiorkor in children was also established /23 and 35/. At the same time, the above-mentioned and a number of other studies /36 and 37/, in principle, established a negative correlation between the yield of a mutant and the content of first and second limiting amino acids in its protein and in some cases, between the level of protein and of limiting amino acids. All this points to the need for further

research on the elimination of this undesirable phenomenon. Undoubtedly, constant biological control can provide significant help in the solution of this problem, for which methodological recommendations on the screening of the quantity and quality of protein during the selection of new mutants of agricultural crops were proposed /38/.

Table 1. Biological Value of Protein of Mutants of Some Agricultural Crops

Crop	Variety	Biological Value PER	NPU	True assimilability, %
Barley I	Control	1.54	59.2	69.5
	Mutant Hiprolly	1.72	64.8	78.7
Barley II	Control		63.0	83.0
	Mutant Hily		71.0	85.0
Corn	Control	1.1		
	Mutant Opaque-2	2.3		
Rice	Control		66.0	
	Mutant with a high content of protein		86.0	

The third way of increasing the biological value of plant protein is connected with its enrichment with limiting irreplaceable amino acids by means of an addition of crystalline forms. This method is highly tempting, because its practical importance is demonstrated in animal husbandry /39-47/.

The enriching effect of the addition of free amino acids to plant protein was also confirmed in investigations with man's participation /48-52/. Table 2 presents data on one of such investigations /51/, in which the state of the nitrogen balance depending on the degree of enrichment of the protein of corn with limiting amino acids was studied in children. It follows from table 2 that a positive nitrogen balance during the consumption of unenriched corn was noted only at the highest level of nitrogen in the diet (about 3 g/kg per day). The enriching effect of tryptophan or lysine alone was detected only at a high level of protein consumption. A more pronounced effect of enrichment was observed during the combination of these amino acids with its further increase upon the addition of isoleucine to this mixture. Simultaneously, it should be stressed that the indicated combinations also had their positive effect at low levels of nitrogen consumption. At the same time, an additional introduction of methionine slightly lowered the retention of nitrogen. The data obtained indicate that with a rational amino acid enrichment of plant protein it is possible to obtain combinations, whose biological value is not inferior to that of milk protein.

At the same time, a certain amount of data indicating that attempts at the enrichment of protein with crystalline amino acids are not always successful has now been accumulated. First of all, it is necessary to note that, as a rule, the effect of enrichment was registered in experiments, whose length was limited. At the same time, some longer investigations, when mixtures of amino acids were utilized as an equivalent replacement of protein in man's diets,

did not demonstrate an identity of ordinary and monomeric nutrition according to the physiological effect exerted by them 53-58. Furthermore, a number of investigations established that, when feed was enriched with free amino acids, the latter had a much higher rate of absorption than the same amino acids entering the lumen of the intestine as a result of protein hydrolysis 59 and 60. It was also shown that mixtures of crystalline amino acids had a higher degree and rate of assimilability than native protein 58. This led to a number of undesirable phenomena, apparently, connected with a simultaneous entry of unusually large amounts of amino acids into circulation, without their adequate correlation.

Table 2. Effect of Addition of Irreplaceable Amino Acids to Corn (C) At Various Levels of Nitrogen Consumption on Nitrogen Balance in Children

Diet	Nitrogen Balance, mg/kg Per Day					
	con-	nitro-	con-	nitro-	con-	nitro-
	sumed	gen	sumed	gen	sumed	gen
nitro-	retention	nitro-	retention	nitro-	retention	nitro-
gen	gen	gen	gen	gen	gen	gen
C without enrichment	469	14	326	-5	238	-10
C+tryptophan	465	33	327	-17	-	-
C+lysine	482	38	335	24	239	-4
C+tryptophan+lysine	461	83	328	36	239	30
C+tryptophan+lysine+isoleucine	475	108	335	40	240	46
C+tryptophan+lysine+isoleucine+						
+methionine	469	90	314	13	240	23
Milk	458	70	364	73	-	-

Thus, the enrichment of protein with free amino acids limiting it as a method of increasing biological value is not a finally solved problem. Therefore, this direction, especially for food purposes, has not yet been widely developed owing to the insufficient study and, apparently, relatively high cost of irreplaceable amino acids of a high degree of purity 4, 61 and 62.

The fourth way of increasing the biological value of plant protein is connected with the development of compositions on the basis of the utilization of the effect of mutual enrichment of protein 5, 40, 63 and 64.

As the data on man's quantitative need for essential amino acids and their most adequate total correlation with replaceable amino acids accumulated, formulas of so-called reference needs for these amino acids for some population groups based on the concept of the amino acid balance were developed 2. It is assumed that the maximum efficiency with which protein evaluated as a source of essential amino acids can be utilized by the animal organism depends on how closely amino acid proportions in this protein meet after a correction for assimilability man's needs for these amino acids 65.

Previously it was noted that all plant protein without exception is limited in certain essential amino acids. It theoretically follows from this that, when rationally combining protein with a deficiency in various amino acids, it

is possible to attain compositions with a smaller degree of limitation and in some cases even with an absence of limitation. Therefore, the development of protein compositions for the purpose of retention of or increase in the biological value of protein in the structure of traditional food products with the utilization, for example, of new sources of protein of plant origin should not only be based on technological and organoleptic characteristics, but also on physiologically substantiated concepts of the amino acid balance of the end product.

Numerous investigations of the development and evaluation of the quality of various protein compositions are described in the literature /14, 51 and 66-75/. It has been shown that the greater the balance of the amino acid composition calculated by the method of chemical score attained during protein combination, the higher the biological value of a mixture of protein determined in experiments on laboratory animals. A disturbance in this principle leads to a decrease in biological value.

Table 3 presents the chemical score relative to the reference scale of the FAO/WHO /2/ and the amino acid composition of protein isolated from plant sources most promising for food purposes and protein forming part of some traditional food products /3, 5, 9 and 12/ considered possible recipients of protein isolates. On the basis of the data presented in table 3 the essential amino acids limiting the protein of these products were determined (table 4), where so-called restricting amino acids, whose effect on the balance during protein combination can be significant, were also designated. It follows from table 4 that all protein of plant origin with the exception of rice is limited in three amino acids. In this case in 9 out of 14 plant products lysine was the first limiting amino acid and the sum of sulfur containing amino acids, in 5. At the same time, protein of animal origin, as is well known, hardly has a deficiency of amino acids, or it is weakly pronounced. For a clearer idea of the nature of limitation it was advisable to divide the products presented in table 4 into two groups.

The first includes all the isolates of plant protein considered promising as its additional sources (eight samples) and the second, traditional food products (11 samples), to which the above-indicated protein is to be added. Table 5 shows the frequency of limitation by essential amino acids of protein pertaining to the first or second group of products. It follows from table 5 that in the group of protein isolates in the frequency of limitation the sum of sulfur containing amino acids (seven out of eight cases) is in the first place and, at the same time, as the first limiting, in five out of eight cases. Threonine holds the second place in the frequency of limitation (six out of eight cases). However, this amino acid in the protein isolates indicated in table 1 is not the first limiting amino acid. Valine is in the third place (five out of eight cases), but only as the third limiting amino acid. The fourth and fifth places are registered for lysine and leucine (three out of eight cases). At the same time, however, it must be stressed that in these cases lysine is the first and leucine the second limiting amino acid. In the remaining amino acids (isoleucine, phenylalanine+tyrosine and tryptophan) there was no limitation of protein isolates. Thus, additional sources of protein of plant origin considered promising for food purposes in almost 90 percent of the cases are deficient in sulfur containing amino acids, in 55 of the 90 percent of the cases, these amino acids are first limiting.

Table 3. Amino Acid Composition (In g per 100 g of Protein) and Chemical Score (In %) of Protein of Some Products

Продукт (1)	Метионин Коэф	Глутамин Коэф	Гистидин Коэф	Аргинин Коэф	Лейцин Коэф	Лизин Коэф	Аспаргин Коэф	Аланин Коэф	Тreonine Коэф	Глутамин + гистидин Коэф	Метионин + лизин Коэф	Лейцин + лизин Коэф	Лизин + аланин Коэф	Гистидин Коэф	Аспаргин + аланин Коэф	Лейцин + аланин Коэф	Глутамин Барн	Барн
Шкала ФАО/ВОЗ (10)	4.0	100	7.0	100	5.5	100	3.5	100	6.0	100	4.0	100	1.0	100	5.0	100	5.0	100
Соя (изолят, США) (11)	4.9	123	7.8	112	6.4	116	2.5	71	9.7	162	3.6	90	1.4	140	4.8	96	4.8	96
Соя (изолят, СССР) (12)	5.2	130	8	125	6.2	113	2.3	66	10.0	167	3.8	95	1.1	110	4.8	96	4.8	96
Подсолничник (изолят) (13)	5.0	125	7.3	104	2.8	51	2.4	69	9.6	160	3.7	92	1.3	130	5.7	114	5.7	114
Глютен пшеничный (14)	4.2	105	6.8	97	1.7	31	3.6	102	8.9	148	2.4	60	1.0	100	4.2	84	4.2	84
Хлопок (изолят) (15)	3.6	90	5.9	84	4.3	78	3.0	88	7.8	130	3.5	88	1.2	120	4.9	98	4.9	98
Люцерна (изолят) (16)	4.3	107	9.1	130	7.4	135	2.2	62	12.0	200	3.5	87	1.3	130	4.6	92	4.6	92
Картофель (изолят) (17)	4.2	105	5.0	71	5.2	96	2.5	71	6.1	101	3.8	95	1.2	120	5.4	108	5.4	108
Томаты (изолят) (18)	4.2	105	6.6	94	6.7	112	2.6	74	8.4	140	4.3	108	1.3	130	4.8	96	4.8	96
Мука пшеничная I сорта (19)	3.7	93	7.0	100	2.1	38	4.0	114	7.2	120	2.7	68	1.1	110	4.1	82	4.1	82
Мука ржаная (20)	4.0	100	6.4	92	3.9	71	3.5	100	7.9	132	3.0	75	1.2	120	4.8	96	4.8	96
Гречка (21)	3.4	85	5.9	84	3.8	69	3.9	111	6.2	103	3.6	90	1.2	120	6.7	134	6.7	134
Кукуруза (22)	3.7	93	12.5	178	2.7	49	3.5	100	8.7	145	3.6	90	0.7	70	4.8	96	4.8	96
Рис (23)	4.2	105	8.2	117	3.6	65	3.7	105	8.0	130	3.3	82	1.3	130	5.8	116	5.8	116
Овес (24)	4.8	120	7.0	100	3.4	62	3.4	97	8.4	140	3.1	78	1.2	120	5.2	104	5.2	104
Говядина I категории (25)	4.2	105	8.0	113	8.5	151	3.8	108	7.8	130	4.3	108	1.1	110	5.6	112	5.6	112
Свинина (26)	4.9	123	7.5	107	8.7	157	3.7	105	7.7	128	4.6	114	1.3	130	5.8	116	5.8	116
Куры II категории (27)	3.9	97	8.8	125	8.2	149	3.8	108	7.9	131	4.6	115	1.6	160	4.3	86	4.3	86
Субпродукты (28)	4.7	118	8.7	124	7.3	132	3.4	97	7.1	119	4.0	100	1.4	140	6.4	128	6.4	128
Молоко (29)	4.7	118	9.5	136	7.8	142	3.3	95	10.2	170	4.4	110	1.4	140	6.4	128	6.4	128

Key:

1. Product
2. Isoleucine
3. Score
4. Leucine
5. Lysine
6. Methionine+cysteine
7. Phenylalanine+tyrosine
8. Threonine 8a. Tryptophan
9. Valine
10. FAO/WHO scale
11. Soybeans (isolate, United States)
12. Soybeans (isolate, USSR)
13. Sunflower seeds (isolate)
14. Wheat gluten
15. Cotton (isolate)
16. Lucerne (isolate)
17. Potatoes (isolate)
18. Tomatoes (isolate)
19. Wheat flour of category I
20. Rye flour
21. Buckwheat
22. Corn
23. Rice
24. Oats
25. Beef of category I
26. Pork
27. Chickens of category II
28. Subproducts
29. Milk

Table 4. Limiting and Restricting Essential Amino Acids for Some Products

Product	Limiting Amino Acids, Score, %			Restricting Amino Acids, Score, %		
	1st	2nd	3rd	1st	2nd	3rd
Soybeans (isolate)						
United States	M+C-71	Thre-90	Val-96	-	-	-
USSR	M+C-66	Thre-95	Val-96	-	-	-
Sunflower seeds (isolate)						
	Lys-51	M+C-69	Thre-92	-	-	-
Wheat gluten	Lys-31	Thre-60	Val-84	-	-	-
Cotton (isolate)	Lys-78	Leu-84	M+C-88	-	-	-
Lucerne (isolate)	M+C-62	Thre-87	Val-92	-	-	-
Potatoes (isolate)	M+C-71	Leu-71	Thre-95	-	-	-
Tomatoes (isolate)	M+C-74	Leu-94	Val-96	-	-	-
Wheat flour of grade I						
	Lys-38	Thre-68	Val-82	-	-	-
Rye flour	Lys-71	Thre-75	Leu-92	-	-	-
Buckwheat	Lys-69	Leu-84	Iso-85	-	-	-
Corn	Lys-49	Thre-70	Thre-90	-	-	-
Rice	Lys-65	Thre-82	-	-	-	M+C-105
Oats	Lys-62	Thre-78	M+C-97	-	-	-
Beef of category I	-	-	-	Iso-105	M+C-108	Thre-108
Pork	-	-	-	M+C-105	Leu-107	Thre-114
Chickens of category II						
	Val-86	Iso-97	-	-	-	M+C-108
Subproducts	M+C-97	-	-	-	Thre-110	Iso-118
Milk	M+C-95	-	-	-	Thre-110	Val-118

A total of 6 out of 11 food products (second group, see table 5) are represented by products of plant origin and 5, of animal origin. In all plant products in 100 percent of the cases lysine is the first limiting amino acid and in 83 percent of the cases threonine is registered as the second or third limiting amino acid in these samples. In livestock products only in two cases (subproducts and milk) is there a small deficiency in sulfur containing and in one case (chickens) in branched amino acids.

On the basis of the presented data it can be assumed that, theoretically, there is quite a favorable situation in which, if the qualitative differences of the amino acid deficiency between isolated plant protein and traditional food products are utilized, there are certain possibilities for the development of protein compositions with a higher degree of the amino acid balance as compared with that of initial components. At the same time, these possibilities would have been much more extensive if we had at our disposal protein isolates not limited in sulfur containing amino acids, because in the list presented in table 4 only wheat gluten belongs to this category. Therefore, there is a need for further research on the development of the technology of isolation of new protein with a high content of methionine and cystine from such sources as, for example, sea products, subcaseous whey and sesame 9, 76 and 77.

Table 5. Distribution of Protein Products Depending on First, Second and Third Essential Amino Acids Limiting Them

Amino acid	Protein Isolates			Limiting Amino Acids			Food Products		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Isoleucine	-	-	-	-	-	-	Chickens	Buckwheat	Buckwheat
Leucine	-	-	-	Cotton	-	-	Buckwheat	Rye	Rye
Lysine	Gluten	Sunflower seeds	Cotton	Soybeans (USA) Soybeans (USSR)	Sunflower	Cotton	Wheat	Rye	Buckwheat
Methionine+ cystine	Lucerne	Potatoes	Tomatoes	(USSR) seeds	-	-	Corn	Rice	-
Phenylalanine+tyrosine	Tomatoes	-	-	Lucerne	-	-	Oats	Subproducts	Oats
Threonine	-	-	-	Potatoes	-	-	Milk	-	Milk
Tryptophan	-	-	-	Lucerne	-	-	Corn	-	-
Valine	-	-	-	-	Soybeans (USA)	Chickens	Wheat	Soybeans (USSR)	Wheat

The need for expanding the assortment of new sources of food protein with an individually increased content of primarily sulfur containing amino acids--lysine or threonine--is determined by the very important task of increasing the biological value of traditional and of developing high-quality, new food products on the basis of the maximum utilization of secondary raw materials. A direct utilization of such protein in man's nutrition will make it possible not only to rationally save complete protein of animal origin (principle of replacement) and to create analogs of food products (principle of texturing), but also to develop products of a high biological value (principle of mutual enrichment).

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CSO: 1840/273

PHARMACOLOGY AND TOXICOLOGY

UDC: 616.12-008.46-06:615.285.7

CARDIAC RHYTHM DISORDERS AND CONDUCTIVITY FOLLOWING PESTICIDE CONTACT

Kiev VRACHEBNOYE DELO in Russian No 9, Sep 82
(manuscript received 13 Apr 81) pp 100-102

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[Abstract] Some 1305 persons from 18 to 54 years of age in contact with chlorinated organic and organophosphorus pesticides were studied to determine the frequency and nature of cardiac rhythm and conductivity disorders. It was found that exposure to chlorinated organic and organophosphorus pesticides or carbamates caused automatism function disorders. Contact with TMTD [tetramethylthiuramdisulfide] affected primarily intracardiac conductivity. Subjects who had experienced acute poisoning with chlorinated organic pesticides showed more frequent intracardiac, atrioventricular and intra-ventricular conductivity disorders, apparently as a result of dystrophic changes in the myocardium.
[353-6508]

UDC 340.67:615.285.7.07

ISOLATION AND DETECTION OF BITEX IN FORENSIC CHEMICAL ANALYSIS OF BIOLOGICAL MATERIAL

Moscow FARMATSIYA in Russian Vol 32, No 2, Mar-Apr 83
(manuscript received 29 Jan 82) pp 39-42

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[Abstract] The author studied a method for identifying bitex, also known as sulfidophos, lebicide and phenthion (0,0-dimethyl-0-(3-methyl-4-methyl-mercaptophenyl)thiophosphate, in cadaver tissue using thin-layer chromatography. He also investigated the possibility of using preliminary agar-diffusion

tests. The most sensitive reaction involved palladium and bromophenol reagents with 4-aminoantipyrine, which detected as little as 1.4 mcg of bitex in a test spot. Isolation of bitex from cadaver material was accomplished with n-hexane in the presence of anhydrous sodium sulfate. Preliminary purification with an n-hexane-DMFA system was also effective in separating the basic extractive substances. Other variants indicated the advantages of using a system with a mobile benzene phase. The test was found to be reliable and applicable for studying cadavers that have not undergone deep decomposition; with such advanced decay the method was not reliable. Prior enzyme agar-diffusion testing was found to be a useful supplement that should not be assigned a negative forensic chemistry meaning. Up to 70 mcg of bitex in 25 grams of cadaver organ could be detected. References 7: 6 Russian, 1 Western.

[709-12131]

UDC 612.42

COBRA TOXIN AND CHOLINERGIC BEHAVIOR IN AMPHIBIAN LYMPHATIC CENTERS

Leningrad FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian
Vol 69, No 2, Feb 83 (manuscript received 27 Jul 81) pp 258-262

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[Abstract] Studies of choline-receptive properties of nerve cell membranes using neurotoxins have given ambiguous results. The present work sought to clarify the site of action of a neurotoxin. The authors studied the effects of cobra toxin (from *Naja naja oxiana*) on the spinal cord of *Rana temporaria* frogs. The toxin suppressed motor activity and brought about varying degrees of partial blockage; 17-hour exposure to the toxin at +4° C brought complete blockage of motor neurons. No changes in motor activity were noted in the control tests, which used a normal Ringer solution. Results indicated that cobra toxin caused gradual decrease in the number of impulses generated by lymphatic center motor neurons until complete cessation of motor activity. The control tests showed that the suppression was caused at the point of contact. Figures 3; references 16: 5 Russian, 11 Western.

[360-12131]

PUBLIC HEALTH

INFORMATION ON "CONDITIONS OF GENERAL AND CHILD MORTALITY AND MEASURES FOR LOWERING IT"

Baku AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL in Azerbaijani No 9, 1976
pp 70-73

Unsigned

[Text] It is known that one of the types of data characterizing the situation of public health development is information on general and child mortality. The question "Conditions of General and Child Mortality and Measures for Lowering It" was discussed at the 14 January 1976 meeting of the staff of the Azerbaijan Ministry of Health, which summed up the work in this field.

The staff noted that general mortality data in the last 5 years were somewhat stable. This, primarily, is connected with changes in age characterized by the growth of young people in the republic's population; changes in age are rather high.

Based on 1974 statistical data, the general republic mortality rate was 6.5 per 1000; 6.3 in urban areas and 6.7 in rural areas. One must note that although this republic figure is slightly greater than in 1973, it is significantly lower than the average Union figure which was 8.2 per 1000 of population. The mortality rate was only higher than the Armenian SSR, which had 5.3 per 1000 of population.

However, average republic figures are not the same everywhere in the republic. One must note that in 1974 the mortality rate of the population in 29 rayons was higher than the average figure. Thus, it was 8.7 in Gasym Ismayylov rayon, 8.6 in Hadrut rayon, 8.4 in Ordubad and Yardym rayons, 8.2 in Aghdam rayon, 8.1 in Martuni rayon and 7.9 in Balakan and Gusar rayons.

Analysis reveals that, as a whole, rather high child mortality affects the republic's general mortality rate.

A rather high mortality rate has been determined among children up to the age of 4 and among those aged 50 and above. Generally, the mortality rate is as follows: age 50-54, 7.8; 55-59, 11.6; 60-61, 19.2; 65-69, 22.8; 70 or older, 58.1.

Another facet compels attention, namely that in 1974 relative to 1973 the general rate of child mortality up to age 4 grew to 27.3% from 25.6%, of which children aged up to 1 year constitute 45%. Child mortality up to 1 year grew 8% in cities relative to 1973 and in rural areas 9%; this increase also continued in 1975. Thus, in the course of 6 months in 1975 child mortality increased 23% relative to 1974; in cities 12% and in rural areas 32%.

In 1974 a high rate of child mortality up to 1 year was noted in Gasym Ismayylov rayon, constituting 73.9 of every 1000 born; figures for the remaining rayons is as follows: Shahbuz-66.4; Aghdash-63.4; Kalbajar-63.4; Stepanakert-62.4; Gusar-58.9; Zagatala-55.4; Yardymly-50.0, etc. This coefficient is 32.0 in the republic.

At the same time child mortality dropped in certain cities in 1974 relative to 1973; by a factor of 3.1 in Zangilan rayon; by a factor of 1.9 in Balakan rayon; by a factor of 1.8 in Zardab rayon; by a factor 1.5 in Mirbashir rayon, etc.

Also, one can note that in rayons with a high rate of child mortality general mortality was also high.

Analysis of the incidence of mortality in the republic in 1974 shows that first place in causes of child mortality is held by lung sicknesses, and intestinal and infectious diseases among newborns; as for older people, death occurred as a result of circulatory and lung diseases, and different tumors.

It is interesting that in the republic in 1974 mortality from circulatory diseases was higher among women than men.

Death from myocardial infarction was higher in men than women. Death related to problems of the circulatory system was higher in urban than rural areas. The mortality rate is influenced in no small way by timely medical help, especially emergency surgery.

In the last 6 years, despite frequent study and discussion of the causes of the incidence of death in meetings of the collegium, the late hospitalization of the sick who needed emergency surgery is noted. In our republic in 1974 the percentage of sick people admitted to a clinic 24 hours after the onset of illness is significantly higher than the All-Union average. Because of this, the mortality rate among those operated upon is high relative to the All-Union percentage.

The collegium noted that every year broad prophylactic measures are implemented by public health organs and institutions, medical care for the population is being constantly developed, the extent of the application of scientific achievements to practise is being raised, etc.

However, study of selected material for different rayons of the republic has shown that inadequacies in medical care institutions caused high figures relative to the mortality rate of the population as a whole; these

consist of insufficient medical observation of pregnant women, unsatisfactory prenatal care, the fact that a certain percentage of new births take place in the home, unsatisfactory observation of children up to the age of one year especially in rural areas, weak prophylaxes for rachitis and hypotrophy, late consultation with pediatricians, poor treatment of children at home, premature release from the hospital, inadequacy of hospital dispensaries, late hospitalization of those requiring emergency treatment, etc.

These shortcomings in medical services are noted in Guba, Gusar, Gasym Ismayylov, Ujar, Aghdam, Ismaylyly, Ilich, Langaran and other rayons.

The collegium of the AzSSR Ministry of Health, which gives great importance to the questions touched upon, adopted a decree directed at reducing the mortality rate. With this decree, it proposed to prepare and discuss a prospective plan with relevant institutions of the Ministry of Health within two weeks for the reduction of illness within the population and reducing the mortality rate--the proposals are the following:

--detailed information on instances of sickness in the population and child mortality be given to the collegium for discussion by 1 July every year;

--it was proposed to the Rector of the N. Narimanov Azerbaijan State Medical Institute that his workers in appropriate departments work out measures on reducing the mortality rate among the population and recommend studies on causes of death;

--it was proposed to directors of scientific research in roentgenology and oncology, mother and child care, tuberculosis, traumatology and orthopedics, microbiology, epidemiology, virusology and hygiene that they study the causes of general and child mortality in the republic and submit obtained results to the Ministry of Health in May 1976.

There is no doubt that the duties set forth and measures implemented will help in reducing both general and child mortality in the republic.

*

Systematic measures for the improvement of medical services for children, the combining of pediatric functions by the republic Ministry of Health for the purpose of reducing disease and child mortality and increasing the expertise of workers in children's health clinics are being implemented.

Thus, from November 1975 to July 1976 traveling seminars for pediatricians and obstetrician-gynecologists were organized in the cities of Sumgait and Kirovabad, and the rayons of Gazakh, Aghdam, Lankaran, Yevlakh, Zagatala and Guba.

In all local hospitals more than 26 beds for pediatricians were set aside and combined. Now, with the permission of the Finance Ministry, measures are being taken for separating pediatric duties so that they are independent from all the beds in local hospitals.

In rayon children's hospitals increased attention is being given the organization of intensive care units and their correct functioning.

In 6 months of 1976 highly trained physicians of the N. Krupskaya Scientific Research Institute for the Protection of Mothers and Children, the N. Narimanov Azerbaijan State Medical Institute and the A. Aliyev Azerbaijan State Institute for the Advanced Training of Physicians were sent to rayons with the goal of giving practical help wherever a high child mortality rate was observed in 1975.

As a result of systematically implemented measures, in 5 months of 1976 the republic's child mortality rate declined by 20.6%. In rayons where a high mortality rate was observed in 1975 a significant decline in the mortality was also noted.

There is no doubt that the duties set forth and the measures noted will aid in reducing general and child mortality.

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OPINION OF WOMEN LIVING IN VILLAGES OF AZSSR CONCERNING THE NUMBER OF CHILDREN IN THE FAMILY

Baku AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL in Azerbaijani No 6, 1975 pp 76-80

Article by A. A. Ahmadov

[Text] In population growth at the present time the birth process, which plays an important role, is gradually turning into a process dependent on the will of parents. Permitting abortion and the wide application of new and effective methods against pregnancy are making it possible more and more to limit the number of children in a family. The study of women's opinion with regard to the number of children in a family in rural areas which earlier had not exerted control over the number of children in a family in the AzSSR (R. I. Sifman) has great importance in defining the future dynamics of the republic's birth process.

Although women's opinion on the number of children in a family has been widely studied in the USSR (V. A. Belova, A. Y. Darskiy, 1972; G. P. Kiseleva, 1968; A. A. Petrakova, 1968 and others) and abroad (P. Whelton, G. Ascadi, Z. Stoetzel, A. Klinger, E. Szabady and others), this question has hardly been touched upon in our republic.

With the goal of studying the opinion of women about the number of children in a family a survey was conducted among more than 10,000 women born between 1900-1952 who live in 52 villages in 22 rayons of the republic. During the survey data was collected on the ideal number of children in a family (the number of children considered best for a family without taking circumstances into account), the number of children desired in one's own family and the father's opinion on the ideal number of children.

It is known that opinion on the number of children in a family is formed over a long term as a result of the influence of complex factors in the people's living conditions (socio-economic, socio-hygienic, cultural, etc.), which creates certain social norms, and certain individuals or groups of the society observe these norms.

In order to analyze our collected data we have divided the rayons in which we conducted the survey into 3 groups according to geography, climate,

economy and national characteristics. Group I--villages primarily occupied with cotton culture and animal husbandry settled in the plains--is Azerbaijani. Group II--villages not occupied with cotton culture settled in mountains and foothills--is Azerbaijani. Group III--villages not occupied with cotton culture in the Gorno-Karabkah Autonomous Oblast--is Armenian.

Analysis of data from women unable to give an opinion on the number of children in a family revealed that 25.4% of women living in rural areas have no opinion. This shows that a significant percentage of women in rural areas have no control over the number of children in a family. Although this figure was 26.1% and 24.8% in Group I and Group II rayons, it is 22.7% in Group III rayons. The number of women unable to answer the question on the number of children in a family changes according to their age and the number of children in a family. Thus, only 20.4% of women age 20-29 could not answer this question, this percentage increased as they grew older and reaches 35.9% which shows that among women who entered family life and matured in recent times there was a more definite opinion about the number of children in a family. The experience of family life and raising a child, without a doubt, plays an important part in forming such an opinion. Although 35.9% of women who still had no children were unable to answer the question, among women with 4 or more children this figure drops to 20.0%

CHART I

Year of marriage					
	to 1940	1940-1949	1950-1959	1960-1967	Total
A. Group I	6.4	6.3	5.7	4.7	5.8
Group II	5.8	5.7	5.2	4.2	5.3
Group III	5.4	4.6	4.2	3.6	4.8
Total	6.0	5.9	5.4	4.5	5.5
B. Group I	6.3	6.2	5.6	4.6	5.6
Group II	5.6	5.5	5.0	4.0	4.9
Group III	5.2	4.4	4.1	3.5	4.7
	5.9	5.8	5.3	4.4	5.3
C. Group I	6.6	6.5	5.8	4.8	6.0
Group II	5.8	5.7	5.3	4.1	5.4
Group III	5.3	4.6	4.2	3.7	4.9
Total	6.1	6.0	5.5	4.5	5.6

A--Ideal number of children;

B--Ideal number of children for one's own family;

C--Ideal number of children according to husband.

The resulting formation of opinion of the number of children, which is dependent on the age of the women, where they live and the number of existing children, can be calculated statistically. Thus, the correspondence coefficient (χ^2) applied in all cases shows an influence with the probability of $P>0.01$.

Average calculated quantities based on the opinion of women answering the question on the number of children in a family is given in Chart I.

First of all one must note that the number of children wanted in one's own family is less than the ideal number of children wanted. Based on this result the women took all conditions and possibilities into account in defining the number of children wanted in their own family. Contrary to this, the ideal number of children in the father's opinion is higher than the mother's opinion. In our opinion the reason for this is that the fathers are less occupied than the mothers in raising children. One can say that all the difficulty in looking after children falls upon women, especially in rural areas, because of existing customs and traditions. Because this similarity exists in all groups, we will subsequently use the ideal number of children only according to women's opinion.

According to women living in rural areas the average ideal number of children is 5.5. Opinion with regard to the ideal number of children depends on which rayon they live in and when they got married. Thus, although the ideal number for Azerbaijani women living in Group I and II rayons averages to 5.8-5.3, for Armenian women in Group III rayons 4.8 is better.

According to the opinion of Azerbaijani women who married up to 1940 the ideal number of children in a family was 6.4-5.8; it was 5.4 for Armenian women. As time went on women's opinion on the number of children in a family changed and a new relationship to the number of children in them was created. Thus, according to the opinion of women married between 1960-1967 fewer children--for Azerbaijani women 4.7-4.2 and for Armenian women 3.6--begin to be considered the ideal number for a family. The change of relationship to the number of children in a family appears to be related to the women's age. Although women 50 or older considered the ideal number to be 5.7, 19 year old women consider this to be 4.7. Thus, one can say that among women living in republic villages a definite opinion exists on the number of children in a family and, according to this opinion, women are beginning to consider a family with fewer children to be ideal. But as a result of the complex influence of local characteristics, national customs and traditions and a series of other factors, the number considered ideal by rural women is significantly higher than the figures expressed by women in the majority of other republics.

The gradual reduction of the ideal number of children in the women's opinion, which depends on their age and when they got married, shows that it will drop even further in the future due to even newer factors.

While realizing the possibilities of the woman attaining the number of desired children, one can expect the birth process in the republic to fall even further. However, one must note that the number considered ideal by rural women will continue to assure the present large reproduction rate of the republic.

The opinion of women on the ideal number of children in the family will undoubtedly not remain static but change as a result of living conditions and experience. From this point of view the survey is very interesting in analyzing women with different numbers of children with regard to the ideal number of children in a family (Chart 2).

CHART 2

Ideal number of children

Number of children	Total	Group I	Group II	Group III
0	4.20	4.40	4.21	3.70
1	4.06	4.31	3.80	3.42
2	4.12	4.32	3.80	3.60
3	4.57	4.86	4.40	4.11
4	5.29	5.59	5.00	4.83
5 or more	<u>6.50</u>	<u>6.70</u>	<u>6.30</u>	<u>5.80</u>
Total	5.50	5.80	5.30	4.80

Primarily, along with differences of opinion with regard to the number of children of women living in rayons with different agricultural, economic and national characteristics, a dependence in the opinion of women with existing children strikes the eye in all rayon groups. Thus, those emerging as proponents of the fewest children are women with 1 or 2 children. This is primarily connected with the women's confronting a number of difficulties in taking care of and raising 1 or 2 children. Women who still have no children are proponents of having more children since, as a rule, they did not meet with such difficulties. Finally, those gaining in skill and experience with 3 or more children and who have surmounted these difficulties are proponents of even more children.

Dividing the women according to the number of children they think ideal, which depends on the number of children in the family, shows that the more children in the family, the number of proponents of even more children increases (Chart 3).

CHART 3

Number of children	Ideal number of children (%)						Total
	0	1	2	3	4	5 or more	
0	0.2	2.0	11.9	23.6	37.3	25.0	100.0
1	---	9.0	12.8	19.9	32.0	26.3	100.0
2	---	---	24.7	15.7	33.4	26.2	100.0
3	---	---	1.0	35.6	32.0	31.4	100.0
4	---	---	0.6	1.3	54.3	43.8	100.0
5 or more	---	---	0.4	0.7	4.6	94.3	100.0
Total	0.1	0.9	5.1	11.2	25.6	57.1	100.0

Women who consider no children to be ideal or 1 child among women living in rural areas are very small in number and only constitute up to 1.0%. They are also among some of the women having either no children or 1 child.

Approximately more than half the women considered 5 or more children to be ideal. Half the women with 1, 2 or 3 children and more than half overall considered the 3-4 child family to be ideal. As for the great majority of women with 4-5 children, they considered a family with more than 4 children to be ideal. Thus, we can say that if more women are in favor of fewer children and, related to this, if the number of women with many children is reduced, then, as a result of the increase of women with 1 or 2 children one can expect that women, on the average, will desire fewer children in the future.

Our research shows that the number of children born to women in their child-bearing years is either the number they consider to be ideal and cases in which it is fewer than wanted is rare. Thus, the number of children considered to be ideal by women 40-49 and 50 or older in various rayons is 5.80-4.90 and 5.90-5.30; as for the number of their own children, although it is 5.60-4.60 and 5.70-5.10 they actually had 5.20-4.10 and 5.30-4.50. The number of children which women, on the average, considered ideal or wanted for themselves is being implemented at the rate 8-15%. If we consider that abortion is rare among women in their childbearing years (4-6% of Azerbaijani women; 8-20% of Armenian women), it is possible to definitely say that they are making an effort to control the birth process and limit the number of children in the family; one can state definitely, based on the significant increase in abortions relative to birth of these women that they are making use of abortion with this in mind. Thus, one can expect an even higher proportion of women not yet in the childbearing years will try to reduce the number of children. This will cause a faster reduction of the republic's birth rate. One of the reasons for the significant reduction in general birth statistics in the republic is undoubtedly this.

Related to this, it will fall as a serious duty to public health organs in rural regions of the republic, especially the midwife-gynecologists, rural doctors and midwives, to strengthen the struggle against abortion by broadening sanitary education work on the harmful influence of abortions and to apply more productive means and channels which can be taken against pregnancy more widely.

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CHARACTERISTICS OF CHILD MORTALITY IN BAKU

Baku AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL in Azerbaijani No 10, October 1971 pp 69-71

Article by M. N. Asadullayev, Faculty of Social Hygiene and Health Organization, N. Narimanov Azerbaijan State Medical Institute

[Text] The mortality rate in old Russia was high because of widespread exploitation, poverty, infectious and general diseases, noncompliance with sanitary rules at work or home and the complete denial of rights for women. In V. I. Lenin's 1912 article "Capitalism and Consumption" attention was drawn to the extremely high mortality rate among children in tsarist Russia.

At that time P. F. Kudryavtsev, P. I. Kurkin and other progressive Russian researchers mentioned the effect of socioeconomic factors on demographic data, especially the extremely high incidence of child mortality.

In Azerbaijan, which was a backward region of tsarist Russia, women--especially Azerbaijani women--were held down in the heavy chains of slavery, feudal relations and religious superstitions. One can say that medical care was not given to women and children. The network of medical birth clinics in Baku, where capitalistic exploitation had reached its highest form and where women aged rapidly and died young, consisted of only one 35-bed maternity ward, and in the Balakhany Hospital (now the Chaparidze Hospital) there were 16 beds for birth and 8 for gynecology. In addition to these there were 15 beds for giving birth in 3 private hospitals.

The number of child-care institutions was very limited; there was one educational home for orphans and one children's consultation clinic (called 'A Drop of Milk'), 60 beds for children in hospitals and a small children's sanatorium for 40 people. These children's care centers were founded through the efforts of progressive physicians of that time, Y. Y. Kindesin, A. Y. Shahnazarov, V. G. Mitrofanov and others, and supported through charitable societies.

Due to the lack of sufficient beds for birth and the absence of children's health clinics, children were often born at home in unsanitary conditions with the help of people lacking contact with medicine and without the aid

of older women. This brought forth a high incidence of mortality among women giving birth which reached 8-10%. In the breastfeeding of children and taking care of them the most basic hygienic rules were not followed. There was no supplementary feeding. Children grew up and were educated under bad living conditions, in difficulty and apathy; they did not have enough nourishment and were deprived of natural light and fresh air.

As a result of the widespread nature of infectious diseases, small pox, measles, dysentery and toxic and general dyspepsia, a significant number of children died.

Under these difficult conditions the average life span did not go over 27.

A total of 400 of every 1000 newborns died (according to K. Y. Farayova). Thus, child mortality in Azerbaijan of the past was roughly 40%.

With the establishment of the Soviet government in Azerbaijan, women emerged from bondage into freedom and great socioeconomic achievements quickly began to lower the mortality rate among children as a result of the development of public health.

As a result of concern for the preservation of the health of mother and children shown by the Communist Party and Soviet government, the network of clinics was expanded. The work of natal care was rapidly developed. Special institutions for the preservation of mothers and children were created and the number of maternity wards and beds rapidly increased. Along with all this, major measures were taken to expand housing construction and to make health and utility improvements in living areas. Widespread sanitary education and the raising of the cultural level of the population also helped reduce child mortality. For example, after 1949 the child mortality rate dropped from year to year--this can be characterized by the following statistics: if 1950 data is accepted as 100%, it was 83.5% in 1955, 52.4% in 1960, 34.3% in 1965 and 22.8% in 1968.

This is related to the drop in child mortality, the general advance of economy and culture in our country and the development of public health, especially medical services for women and children.

At the same time it must be noted that along with the significant decrease of child mortality in Baku, mortality at birth has also decreased in recent years. Thus, whereas the relative figure at birth in 1940 was 32, we see that it was 26.9 in 1950--this was connected to the war. In 1960 the figure increased slightly to 27.8. This fell somewhat in subsequent years and in 1965 was 21.8.

However, a definite drop in child mortality under conditions in which data relevant to birth falls significantly caused a natural increase in the population.

Based on an analysis of the drop in child mortality, one can note that it was accounted for fundamentally by the drop in deaths among children older than one month.

At the same time one must note that death occurs often among children who have not reached their first month, especially within the first week.

The number of those dying within the first week of birth constitutes 70-80% of child mortality in the first month in different years; death in the second week falls and varies between 12-13%; it is 8-10% in the third week, and 4-8% in the fourth week.

It must also be noted that child mortality in the first week is rather high and a significant portion of this occurs on the first day. Child mortality on the second day is twice as low and diminishes from day to day so that on the 7th day it constitutes 6-12% of those dying on the first day. In recent years the child mortality rate in Baku, especially those past their first month, has significantly fallen.

If 100% is accepted as the child mortality rate in 1960, we see that it dropped to 55% for those between one and four months in 1968, 48% of those between 1-7 months and 32% for those aged between 6-10 months.

Between 1955 and 1968 child mortality was reduced three-fold and, according to the 1960 figure, dropped to 53.3%.

There is a great importance in reducing the mortality rate among the newborn in order to reduce child mortality overall.

A. F. Tur, R. A. Malyshev, A. K. Sporiyanov, G. A. Bairov and others note the great importance of taking all prophylactic measures in reducing the incidence of mortality among the newborn.

It is also interesting to note that successes in the struggle to reduce child mortality in the first week after birth have been described in the literature. Thus, R. B. Kogan, V. O. Gotlib, A. P. Matveyev, N. F. Podchayeva and others have shown the decline of this statistic in different cities of the Soviet Union.

In economically developed capitalist countries, child mortality in the first week after birth is high and falling very slowly.

We have studied the dynamics of child mortality in Baku. It is clear from the research that child mortality is dropping from year to year but, although there is a general decrease in this statistic, among children in the first week and first month it is still high.

In connection with this, there is still a lot of work to do in reducing the child mortality rate, especially among children in the first week and first month of life. One must take definite measures to deeply study child mortality rates, to implement prophylactic and organizational measures during pregnancy, to conduct observations, to control natal activities in the maternity wards, to take care of them in a sophisticated manner, to continue observation and control after birth, to service children after their release and to take definite prophylactic measures.

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PROTECTION OF MOTHERHOOD AND CHILDREN IS A STATE MATTER

Baku AZERBAYDZHANSKIY MEDITSINSKIY ZHURNAL in Azerbaijani No 9,
September 1979 pp 3-7

Editorial

[Text] At present children constitute one out of three of the world population. The future of every country and of mankind depends on what they will have learned and on their leadership in ideas when they grow up. Thus, the declaration of 1979 to the International Children's Year by the 31st session of the UN General Assembly is an important event for all men who are not indifferent to the future of our planet.

In the declaration on the rights of children accepted by the UN it says: "Mankind must give the very best they possess to children."

More than 20 years have passed since the acceptance of this declaration. Its principles are being successfully implemented in the socialist states. In a number of countries of the world, however, the conditions of this declaration remain unachieved. Connected with the declaration of the Children's Year, new prospects for broadening the struggle for children's rights are being established.

It is written in the CPSU program: "One must guarantee a happy childhood for every child." Also, demands of the younger generation are taken into account in our economic plans and in all decrees of party and government.

The Communist Party and Soviet government have given and continue to give special attention to the protection of mothers' and children's health in all stages of the development of our state. The importance of a broad spectrum of women's health protection--both mothers and children--under contemporary conditions has been noted in decrees of the 25th CPSU congress. The decrees communicated the continuing measures to improve the work and living conditions of working women as an obligation.

The October revolution laid the foundation for a state system of motherhood and childhood. Protection of the health of women and children became one of the most inviolable duties of the state from the first days of the Soviet government.

The formation and development of the work of protecting motherhood and childhood is closely bound with the name V. I. Lenin. Questions on the protection of mothers and children were prepared by V. I. Lenin's party and included in the program accepted at the 2nd RSDFP Congress in 1903.

The victory of the Great October revolution made it possible to implement the program.

The protection of mothers' and children's health was declared to be an inviolable state affair and an important component part of public health. It is impossible not to recall the compelling lines of a decree accepted at a special meeting on mothers' and children's protection which was held on 14 Sep 1922 by the CC RK(b)P.

"The protection of mothers and children, as a question closely bound to the general situation of the working class, cannot be set aside under any condition in which a proletarian state exists and must be a duty set before the party, Soviet government and trade unions."

Commissar of Peoples Health N. A. Semashko wrote an article, "Five Years of Struggle for Mothers and Children," which reflected Lenin's principle of approaching the matter of protecting the health of children as the most important and inviolable duty of the state and entire people; it also pointed out that there are three important factors in the protection of mothers and children--political, socio-economic and sanitary-hygienic--"because for the health of the population one must begin with the health of mother and child." Thus, work in this sector from the very first step was organized not only as work of the Commissariat of Peoples Health but also as the work of everyone holding dear the successes of the building of socialism...In brief, we are raising our banner on which is written "The Health of Mother and Child is a Necessary Condition for the Health of Humanity" ever higher.

Under V. I. Lenin's directive, the RSFSR Soviet of Peoples Commissars accepted a decree which transferred the work of protecting mothers and children from the Peoples Social Welfare Commissariat into the system of the RSFSR Public Health Commissariat.

Other than this, the Soviet government set forth the new "Code of Laws on Marriage, Family and Guardianship" and a number of other lawgiving acts which were included under the general name "Declaration of the Rights of Childbearing Women." By this decree 12-16 weeks of leave, depending on the difficulty of the work, were given by law to women working in production, institutions were established for pregnancy and giving birth, their working rights were preserved during this period, and half an hour out of every three was set aside for feeding a child. It was forbidden to dismiss pregnant and breast-feeding women from work.

Thus, the Soviet government repudiated all laws which had established a woman's subordinate position and opened up here way for her state and sociopolitical activity as an equal member of socialist society.

The protection of mothers and children in Azerbaijan changed form, corresponding to general state obligations at different stages of building socialism. As is known, Azerbaijan was one of the backward areas of tsarist Russia in the past. The rate of sickness and death, especially among children, was very high. Eight-to-ten percent of women died during childbirth, and 45-50% of children did not live beyond the first year.

Until the founding of the Soviet government in Azerbaijan, there was only one children's institutions resembling a clinic which was founded through the efforts of Dr Y. Y. Kindesin in Baku in 1906, and there was also a 60 bed children's ward under the purview of the Garashahar hospital.

In all, 15 pediatricians and 12 obstetrician-gynecologists were active.

In the first years after the establishment of the Soviet government in Zaerbaijan, health organs directed their powers toward the struggle with the remnants of the tsarist Russian legacy and the high incidence of child and mother mortality.

From the first days of the organization of the Peoples Health Commissariat protection of mothers and children was included in a general plan of state measures.

On 31 May 1921 the Revolutionary Committee of the republic passed a decree "On the Protection of Mothers and Children in Azerbaijan." In 1924 the Communist Party CC Plenum adopted a decree "allocating additional money to the Peoples Health Commissariat for the protection of mothers and children and drawing attention to the need to improve the work of training institutes which prepare workers for the protection of mothers and children."

Now in Azerbaijan there are 5,234 birth beds, 163 women's clinics, 393 childrens polyclinics, more than 10,000 beds in childrens wards, 33 sanitoriums and 1,798 schools for children.

A total of 2,415 pediatricians and 950 obstetrician-gynecologists are protecting the health of mothers and children. Great thought is being given children's and natal help in rural areas.

Now the N. K. Krupskaya Institute for the Protection of Mothers and Children is doing major work in the study and research on scientific problems and giving medical aid to the republic's mothers and children, giving a lot of thought to the preparation of scientific cadres and increasing the expertise of workers in institutions for the protection of mothers and children.

In the years of Soviet government in Azerbaijan great successes have been obtained in the sector of protecting mothers and children. The broad network of natal help and child care institutions, the increasing growth of medical cadres, the elimination of a number of infectious diseases and the sharp decline in mother and child mortality testify to this.

The Azerbaijan SSR belongs to the union republics with a high birth rate. Under the conditions of building communism the high birth rate results not only in the woman's involvement in bringing up children, but the state has also taken this basic concern on itself.

In 1977 the new Constitution of the USSR was accepted. In Article 35 of the Constitution it is said that women's rights are specifically guaranteed "by special measures in the sector of protecting the work and health of women thereby creating conditions which make it possible to relate a woman's work with maternal duties, by helping them spiritually and materially, by giving pregnant women and mothers paid leave and other concessions, and by gradually reducing work time for mothers with small children."

In Article 53 of the Constitution it says: "The state shows its concern for the family by creating and developing a broad network of child education centers, organizing and perfecting living services and social sustenance, helping when a child is born, giving help and making concessions to families with many children, and by also giving other forms of help to the family."

The work of mothers who are pregnant or nursing children is especially protected. Pregnant women are not compelled to work overtime or nights and, when possible, are transferred to light work. When nursing a child the woman's work day is short and, if the child is sick, leave is given women for the necessary period in order to help her.

The 25th CPSU Congress set up an elaborate program to further perfect the work of protecting the health of the Soviet people. The "Five-Year state plan for the development of the USSR economy in 1976-1980" foresaw improvement of work and living conditions of working women, defining partially paid leave for working women in order to help her until the child reaches one year, and the creation of broader possibilities for an incomplete work-day or work-week for a woman with a child as well as the possibility to work at home.

Birth clinics, women's clinics, children's hospitals and sanatoriums are being built by means of All-Union communist volunteers. The resolution of the CC CPSU and USSR Council of Ministers "On Means to Further Improve Public Health" was a new manifestation of the Communist Party's and Soviet government's concern. Special thought is given to the further improvement of protecting the health of women and children. Expansion of the network of children's polyclinics, women's clinics, maternity wards, children's hospitals and sanatoriums, labor union sanatoriums and boarding homes for treatment of parents with children, specialized full-day sanatoriums and pioneer camps is held in mind.

Great amounts of money have been set aside for children's health protection in the Soviet Union. Many studies conducted in different areas of the country show the physical improvement of children everywhere. Alimentary hypertrophy and severe forms of avitaminosis have been eradicated.

Treatment and methods of cure for rachitis have been prepared and put into daily practise. Through the advice of scholars, mass preventive vaccinations being conducted form an obstacle to children's diseases.

"A healthy child is a worthy future"--WHO this year held a World Health Day under this slogan. This idea is completely appropriate to the UN decree declaring 1979 to be International Children's Year. All countries received this with great pleasure.

General Secretary of the CC CPSU and Chairman of the Presidium of the USSR Supreme Soviet L. I. Brezhnev, speaking on television, commended the decree and said: "We are building the future with our hands, so the childhood years will be healthy and happy."

The complete development of children, their harmonious upbringing and training is only possible under conditions of peace. Children are the first victims of every injustice occurring on the earth.

The United Nations passed a resolution on children's rights. In this resolution ten basic principles defining the rights which children must have in all the countries of the world were noted.

Here, however, we must mention that in 1979 millions of children in many countries are denied the most basic rights in life, and millions of small children perish from starvation and misery.

For example, only 640 thousand children in the USA, 3 thousand in France, 14.8 thousand in the FRG have the possibility to go to children's institutions. In the FRG there are up to 200 thousand children and teenagers who are compelled to work. The necessity of youths to work 50-60 hours a week, especially in the service sector, is broadly practised.

Turkey is one of the capitalist countries where the situation of children is especially tragic. Noting this, DUNYA newspaper shows that there are now more than 650 thousand orphans in the country. Most of them are concentrated in the big cities.

Inadequate food and housing, racial inequality in medical services, need and disease--millions of African children by whom 80% suffer from malnutrition live under such conditions in the racist Union of South Africa.

In Brazil 3.5 million children have never gone to school. Brazilian law permits teenagers to work from age 12. Ten million such "workers" work 10-12 hours a day. In that country 83% of the children do not receive enough food. In Latin America a child dies from fatigue every 30 seconds.

At the celebratory meeting devoted to Baku's receiving the Lenin Medal, General Secretary of the CC CPSU and Chairman of the USSR Supreme Soviet Comrade L. I. Brezhnev said that we see as a basic duty of our foreign policy to work for the abolition of intensive armaments and to strengthen the peace and security of peoples.

We appreciate that as a result of the efforts of the Soviet Union and other socialist countries, the Peace Program is gradually being implemented.

The signing of an agreement by the General Secretary of the CC CPSU and Chairman of the USSR Supreme Soviet Presidium L. I. Brezhnev and USA President J. Carter on strategic arms limitations in Vienna on 18 June 1979 was an important step forward in implementing the Peace Program. When L. I. Brezhnev signed this agreement he said: "We are helping to defend the most sacred right of everyone--the right to live."

The selection of the slogan "A Secure and Happy Future for All Children" for the World Conference on Childhood Problems held in Moscow in September 1979, which was a high point in International Children's Year, is symbolic.

We are living in a special time, a century of sweeping social changes and scientific-technical revolution. The problem of bringing up the generation growing up under these conditions has special importance. Our children, newborns and children in the first grade will be living and working in the 21st century. The duty, to advance mankind's civilization and to develop scientific technology, will fall to them. We must struggle for them and for our own future.

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MOBILITY AND HEALTH OF CHILDREN

Riga NAUKA I TEKHNIKA in Russian No 12, Dec 82 pp 17-19

LIGA ABERBERG-AUGSHKALNE, docent, Riga Medical Institute

[Text] Axion: In order to be healthy, a person needs a systematic daily mobility. For children this is a biological necessity which controls to a large extent the development of a child's organism at all stages of growth.

It so happens that in our times school age children are becoming less and less mobile. This may be due not only to increased scholastic load, but also to poorly organized physical education. The fifth and sixth graders who participate in sports take about 20-25 thousand steps in a day, their cohorts attending general education schools with linguistic emphasis take only 12 thousand steps and the seniors even less. Even though this "deficit" does not lead to significant changes in one's metabolism, nevertheless, it slows the development of the mobility apparatus of a child and exhibits adverse effect on his physical preparedness.

It was calculated by hygienists that the mental work load on today's students exceeds on the average 2 hrs per day. When the extracurricular activities are added to it (music, languages, etc), plus TV programs, we can see that there is less and less time left for active games and relaxation. As a result of it the cardiovascular system suffers, the bearing is affected, the body mass grows. Occasionally hypokinesis is accompanied by neurological disorders: increased fatigue and irritability, diminished attentiveness, poor memory and sleep. Such a picture is observed most often among young children. And this is quite understandable: the mobility during the first few school years is drastically diminished in comparison to the preschool years.

It is shown experimentally that all indices of physical development and of the ability to perform physical tasks, physical labor, the formation of one's bearing and of the foot as well, along with morbidity, are closely connected with the type and extent of one's mobility. A question can be raised: how does one compensate for inadequate mobility among children and teenagers without hurting their studies, their educational activity and daily routines?

The benefit resulting from daily physical exercises in school is obvious. It was shown that it leads to improved physical development and preparation of children, more effective breathing and blood circulation, increased activity of blood enzymes and less frequent colds. It is important to structure physical education classes more effectively by saturating them with physical mobility, by intensifying the endurance exercises, by performing gymnastics year around in fresh air, especially among lower classes. The number of physical education classes alone is not as important as the development of active interest among the children in mobility activities. This is why many specialists insist that this period be emotionally diversified.

To liquidate hypokinesia, any of the physical education exercises projected by the school curriculum are adequate: exercise minutes during regular classes, organized games on longer class breaks, physical education home work, optional activities, participation in school sports, etc. However, muscular energy cannot be exhausted by class work alone, active mobility should be a constant phenomenon. Judge for yourself: a walk at 3 km/hr pace increases the metabolism 1.5 fold, and faster walk increases it even further. Hence, hikes should not be taken just to "breathe fresh air"--each walk should be an energetic one. Also, children should be participating in dances, either folk dances or in the contemporary ones.

Which mobility habits are necessary for children? Which are the necessary indices of physical identifiers (speed, strength, endurance, flexibility, dexterity, speed, endurance) and which are the criteria for evaluation of various systems in an organism? This will depend on the age and sex of a student. Supposedly, a child entering the school should be able to breathe properly, walk, run, jump (both high and broad jump), throw a ball at a target and for a distance, to maintain static pose sitting and standing, to swim, ski, skate and to ride a bike. This shows the kind of requirements placed on the preschool physical preparation of children.

Under the influence of physical exercises the physiological functions of an organism undergo certain changes. To some extent this is a function of the type and volume of specific exercises, as well as of the ability of the child's organism to adjust to physical load. This must be always remembered.

Any muscular effort is always regulated by the central nervous system. Depending on the dynamics of these processes, a prestarting and starting state are recognized along with periods of working-in, performance, fatigue and restoration. When an organism prepares for a physical exercise, its somatic and vegetative reactions undergo various changes. Children begin to show this at about the 7-8th year of age; in teenagers, 13-15 years old, these changes are clearly exhibited during excitation of their central nervous system. The initiating reaction is regulated by individual experience of a child or a teenager with respect to their accomplishment of physical exercises and mobility activities.

The "work-in" period is actually the beginning of a concrete action, when the movement apparatus prepares itself for the changing situation, ahead of the vegetative system. This occurs at a faster rate not only because

these systems are inert, but also because of intensified dynamics of central nervous system processes occurring primarily in the brain. Therefore, the new level of the vegetative systems providing the muscular activity is reached after 2-7 minutes.

The functional potentials of a child's organism are clearly manifested in an adaptation of the respiratory and blood circulation systems. Under conditions of physical load they "look after" the bioenergy of the organism, they assure lung and tissue respiration, they maintain a steady state in the internal milieu of the organism. The functional state of higher branches of the central nervous system and of the extracardial nervous system shows has characteristics in children and adolescents, affecting the activity of the heart under conditions of excess physical load.

Overall, when the frequency and the duration of a cycle of heart activity is considered, the heart of a child "works-in" faster than that of an adult, this phase lasting 30-45 sec. But along with this, the rearrangement and the synchronization of mechanic and electric processes in the myocardium are delayed and, therefore, it is improper to evaluate the "work-in" process by a single parameter--the rate and the rhythm of cardiac activity. During the "work-in" period the rhythm of heart beat in children is often accelerated (chronotropic reaction), but the rearrangement of heart metabolism and of the phase structure of heart activity occurs at a slower rate in children than in adults.

Duration of work periods depends on the characteristics of physical exercises, their volume and the training of each child. The basic type of heart adaptation in children is the chronotropic reaction with a weakly registered inotropic effect (a change in the strength of heart contractions), therefore, the pulse in children during the load and restoration periods is higher than in adults. Under the influence of maximum veloergometric load, the heart rhythm among the 10-11 years old children reaches 196 bpm (90% of adult level), the maximum blood pressure of 144 mm Hg (66%), lung ventilation and oxygen consumption--about 60% of the adult level. It should be noted that even under the influence of regular training, there is no economization of the functions of a child's organism. This is also supported by a complex index--the oxygen pulse (the ratio of oxygen intake per minute to the frequency of cardiac activity), which at the maximum performance of a child reaches 32% of the adult's level. Recalculating oxygen consumption during maximum work-load to the per kg body weight and to the unit of performed work power, shows that mobilization of oxygen transport system in children is about 1.5 times that of adults.

All of this indicates that physical load in the 8-12 years old children is connected with a considerable stress of vegetative functions, i.e., it "costs a lot". Under the influence of physical load, the children exhibit less effective and less economical oxygen regimens in their organisms. Among 8-9 year old children, the breathing and minute volume of oxygen per kg body weight is higher and the coefficient of its consumption is lower. Also, the 9-12 years old children use oxygen less effectively during physical loads, when recalculated to one breathing cycle.

The differences in adaptive reactions among the boys and girls, considering the changes in the type and magnitude of various functions due to physical exercises, are beginning to show at about 10-11 years of age and become obvious among the teenagers. Physical work ability and maximum indicators of cardiac and respiratory systems of the girls are at the 70-80% level of the boys.

With increased intensity of physical exercises both children and teenagers show more obviously than adults an intensified function of cardiac activity and breathing, they tire much faster. This is explained by the peculiarities of children's age, i.e., expressed mobilization of cardiovascular system, inadequate ventilation of the lungs, inability to adapt to work under anaerobic conditions, poor ability to mobilize carbohydrate reserves of their organism's limited oxygen transport system and lowered glucocorticoid function.

The restoration (restitution) process following a physical load is connected with liquidation of chemical changes of the internal milieu of an organism. After a medium load, blood pressure returns to normal much faster than the rate of heart contractions, and oxygen consumption--much faster than the ventilation volume of the lungs. The slowest is the restoration of the chemical composition of blood.

Lack of synchronous restoration of the most important and mobile vegetative functions (breathing, blood circulation) after a physical load is especially noticeable among children with little mobility. Their restitution is slow after intensive, lasting physical loads, especially during puberty. These restitutions processes speed up under the influence of systematic training.

Physiologic age-related characteristics of the child's organism have a great significance in physical education practice, in selection of correct program of mobility. When supervising physical exercises with children and teenagers, it is necessary to stretch the preparatory portion, because during the warm-up period their myocardium metabolism readjusts on the background of increased rhythm of cardiac activity.

Due to the fact that children's reserves for increased systolic volume are relatively limited, it is necessary to watch out for adaptive chronotropic heart reaction which may serve as an index of load bearing. Because the physical capability of children to use oxygen is limited, the volume loads may be acceptable, but those of intensity are not. During physical education classes special attention should be paid to total muscular load and rest periods should be a part of a routine. In addition, the concluding portion of the exercises should be increased along with rest periods due to prolonged restitution processes.

In conclusion, we will note that movement activity is an indicator of physical capabilities of a human being, his physical potential, which to certain extent is an inheritable trait. This is why there should exist an individualized level of necessary physical activity for each child and adolescent.

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SUGGESTIONS GIVEN FOR IMPROVING THE CITY PUBLIC HEALTH SERVICE

Kishinev SOVETSKAYA MOLDAVIYA in Russian 23 Mar 83 p 2

[Article by V. Revenko, head of the Department of Health of the Ispolkom of Kishinev City Soviet of Peoples Deputies: "The Health Service: A Letter Arrived at the City Department of Public Health"]

[Text] The modern city with a population of half a million is an extremely complex organism, and all services that contribute to its functioning are equally important. It would not, however, be an exaggeration to claim that the health service is indisputably one of the most important, and complex, services in this regard.

The capital of our republic is growing unusually rapidly. Suffice it to say that the amount of people handled by the city medical institutions has increased by almost 100,000 in just the last five years. The health service is evolving to meet these demands. The state of the public health physical plant in the capital today and the professional level of the specialists offers an effective solution to the most complex problems, and it must be said that on the whole the health service of the city is handling it. At the same time, there is still a great deal of just criticism by the people concerning the quality and sophistication of the medical facilities, and of problems with task organizations at therapeutic institutions. Moreover, the number of complaints about apparent shortcomings is even growing.

What is happening? Why don't measures taken to improve the health service always give the required results?

These are by no means rhetorical questions. The correct answer to them requires proper assessment of ways and means to eliminate problems, putting different sections within the health service in a position to give the best answers to the people's inquiries.

In this sense, citizen letters are not just a source of information, but one of the most important criteria for evaluating the work of the health service. By studying them we see, so to speak, the typical shortcomings that we sometimes tolerate or do not notice.

The mail usually arrives at the city health department in the second half of the day. Therefore a sequence has been established: a city public health worker always ends his working day by studying the incoming mail and devising solutions to urgent matters. The letter work is not limited to immediate measures. The second stage is analysis of the mail by month, quarter and year. This makes it possible to "uncover" major problems and find ways of solving them.

Here, for example, is an analysis of last year's mail: 17 percent of the complaints received were valid claims concerning the quality of medical care; 21 percent were applications for hospitalization; 11 percent for consultation and therapeutic care, etc.

Does this analysis reflect an objective picture of the state of affairs? As far as we know, yes. Take, for example, the problem of hospitalization. Let us be candid--at the present time this is one of the complicated problems. Serious difficulties are encountered when hospitalizing patients in neurological, pulmonary, gastrology, urology and certain other departments. What measures have been taken by the health departments in this regard? The most important one is improving the physical plant. A children's hospital and a therapeutic wing of a first aid hospital are to go into active construction before the end of the Five-Year plan. This is not enough to solve the problem, however. We are pinning high hopes on the creation of new medical units and development of existing ones, based on cooperation from industrial enterprises. The time is especially ripe for construction of a 300-bed wing on the premises of a color television factory under construction and other enterprises in the Frunzenskiy rayon and a medical sanitary unit at a refrigerator factory, a TETs and a glass factory. It is time for a decision on construction of a med-san units at the "Signal" and "Microprovod" calculator factories. The respective Union ministries must obviously give a great deal of attention to the solution of this problem. We see definite possibilities for partial solution to the hospitalization problem by careful preparation of patients at the pre-hospital care stage. This shortens the patient's hospital stay and increases bed turnover without detracting from the quality of treatment.

A significant percentage of complaints deal with the functioning of the polyclinic unit and particularly with the quality of primary care. Deserved criticism has come from inhabitants of Nvaya Chekana, Budeshty, Botanika, Teletsentr. The state of affairs has changed somewhat with construction begun on two new polyclinics containing maternity consultation rooms and with the expansion of factory med-san units. Construction on a central polyclinic is to begin in the near future.

Of importance at this time, however, is improvement of in the organization of work. One of the "bottlenecks" in our polyclinics is registration. The functioning of the polyclinic as a whole depends largely on the efficiency of this work, on how the information service is set up. With this in mind, we are introducing self registration to the physician, in the form of an office in the waiting room, which takes the burden off of both physician and patient.

There are also many problems in the organization of work of the physicians. Physicians lose precious time at all kinds of meetings and conferences, in going to auxiliary offices, busy with affairs that could be efficiently accomplished by medium-level medical personnel. These are all reserves, and not just a few.

It must be said that in the search for time-saving reserves, we sometimes show a good deal of individual effort. It would obviously be advantageous to introduce standard, scientifically-based forms that would have to be produced. Scientists from social hygiene departments and from public health organizations of medical institutes could be very helpful in this, in collaboration with sociologists who are specialists.

We are troubled in particular by cases demonstrating a low level of culture in the service--inattentiveness and sometimes even rudeness on the part of the medical staff--instances of malfeasance of official duty. They are, of course, isolated, but we must combat them uncompromisingly, with total decisiveness. Thus, recently, physician K. N. Babaeva was contacted for not providing necessary medical care, and investigative agencies handed down indictments to physician T. P. Belyayeva and Midwife A. G. Pyrtsak, who did not provide appropriate medical care for a patient.

We must admit that we are still not good at generalizing and popularizing the experience of the better collectives and specialists, and that we do not spend a lot of time with the so-called potential transgressors of discipline, medical ethics and professional conduct.

Materials from the November (1982) plenum of the CPSU Central Committee are now being studied intensively in the groups of medical institutions in the city. Since we intend to set up a Plenum at the earliest possible date, we intend to enact a number of important measures intended to raise the levels and culture of the medical service, and to improve discipline, organization and educational work. We plan to carry out open letter days in order to improve public relations and better inform citizens on questions concerning the organization of medical care. We will establish such important organs as "Courts of Medical Honor" at polyclinics and hospitals and we will put into practice a system of accountability of directors of medical institutions to the labor collectives. All of these and many other measures will promote significant improvement in the organization of the health service and will permit it to reach a new and higher level of therapeutic and prophylactic service.

12262
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ESTIMATE OF HEREDITARY PATHOLOGY FREQUENCY DYNAMICS BASED ON COUNT OF SPONTANEOUS ABORTION AND CONGENITAL DEVELOPMENTAL DEFECTS

Kiev TSITOLOGIYA I GENETIKA in Russian No 6, Vol 16, Nov-Dec 82
(manuscript received 1 Jun 82) pp 33-37

BOCHKOV, N. P., PRUSAKOV, V. M., NIKOLAYEVA, I. V., TIKHOPOY, M. V.
and LUNGA, I. N., Institute of Medical Genetics, USSR Academy of Medical Sciences, Moscow

[Abstract] The purpose of this work was to estimate the dynamics of hereditary pathology frequency over a 10 year period based on counts of spontaneous abortions, congenital developmental defects, Down's syndrome and an indirect estimate of perinatal mortality based on hospital records from the city of Angarsk. Records of 34,951 pregnancies and 34,815 births between 1971 and 1980 were analyzed. The dynamics of hereditary pathology "units" showed no time trend. The dynamics of hereditary pathology frequency can be considered a genetic monitoring characteristic which can be used to judge the status of the process of mutation. Figure 1; references 24: 10 Russian, 14 Western.

[354-6508]

RADIATION BIOLOGY

UDC 613.648:621.311

RADIATION AND HYGIENIC ASPECTS OF ENSURING SAFE WORKING CONDITIONS AT ATOMIC POWER STATIONS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 2, Feb 83 pp 1-4

PARKHOMENKO, G. M. and YEGOROVA, M. O.

[Abstract] Data confirming work conditions at Soviet AES for workers of all categories, under different radiation levels and in different states of health are being collected. Data concerning individual and collective radiation doses from water-modulated water-cooled (VVER-440), RBMK-1000 [expansion unknown] and fast neutron (BN-350) reactors show that radiation levels are near those found in foreign AES and meet the standards set by the International Commission on Radiological Protection for protection from radiation hazards. Peculiarities of organizing and performing AES repairs are discussed and measures for reducing radiation hazards are described. Safety recommendations include the achievement of higher standards of operational reliability of equipment, improvement of worker efficiency and delineation of clear-cut criteria to be used in determining suitability of workers to work at AES.

[363-2791]

UDC 613.646-02:612.57-064

DETERMINATION OF OPTIMAL INTENSITIES OF HEAT IRRADIATION OF A MAN WORKING AT LOW TEMPERATURES

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 2, Feb 83 (manuscript received 26 Aug 82) pp 38-41

KASPAROV, A. A., SHAMARIN, V. N. and AFANAS'YEVA, R. F., Institute of Labor Hygiene and Occupational Diseases, USSR Academy of Medical Sciences, Moscow

[Abstract] Healthy males (25) ranging in age from 25 to 35 years worked 128 shifts (4 1/2 hours each shift) in air temperature from -1°C to -9°C

while wearing appropriate protective clothing with only the head area uncovered in electric radiant heat flows of different intensities. The optimal intensity of heat flow when the workers were working at average intensity (energy expenditure of 208 W) at -1°C and air movement of 0.3 m/s was 215 W/m². With a decrease in temperature while other conditions remain unchanged, comfort is maintained by increasing the intensity of heating by 17.5 W/m²/degree of temperature drop. Comfort levels were placed at 14-17.5° at the level of the torso, hands and feet and at 9-14°C at head level. References 17: 12 Russian, 5 Western.

UDC 613.648.002.71

HYGIENIC ASPECTS OF INTERNATIONAL SHIPMENTS OF RADIOACTIVE MATERIALS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NNYE ZABOLEVANIYE in Russian No 2, Feb 83 (manuscript received 10 Jun 82) pp 46-47

FREYMAN, E. S., Institute of Railway Hygiene, Moscow

[Abstract] Some problems encountered in the increase of international shipments of nuclear materials with emphasis on problems related to hazards in railway shipments are discussed. Special rules for handling nuclear wastes in the USSR have reduced the contamination hazards of loads to a level which is 10 times lower than the level enforced in the USA and in Western European countries. Optimal arrangement of shipment and transhipment points and optimal organization of work conditions for different operations are discussed. Use of these procedures reduced the annual radiation doses of full-time workers to less than one half the permissible level and reduced the doses received by part-time workers handling low-volume shipments to no more than 0.7 of the permissible dose. A formula for tentative assessment of annual exposure doses in shipment areas is presented and explained.

References 2.

[363-2791]

PARAPSYCHOLOGY

SOVIET WRITER DISCUSSES ROLE OF FANTASY LITERATURE IN THE PROGRESS OF SCIENCE

Moscow VOZDUSHNYY TRANSPORT in Russian 26 Mar 83 pp 3-4

[Conversation, conducted by VOZDUSHNYY TRANSPORT correspondent L. Tsesarkin in the column: "Reality and Hypothesis": "What the Future Century Is Preparing for Us..."; with Aleksandr Kazantsev, Science-Fiction Writer]

[Text] Aleksandr Petrovich Kazantsev is one of the founders of the science-fantasy genre in our nation. His remarkable novels "Pylayushchiy ostrov" [Burning Island], "Arkticheskiy most" [Arctic Bridge] and other fascinating works have captivated more than one generation of Soviet readers. The writer's works have been issued in a total circulation of more than 4.5 million copies and have been translated into more than 20 foreign languages.

During the Great Patriotic War A. P. Kazantsev was a military engineer and supervised a large scientific research institute. The writer ended the war in Vienna, commissioned by the USSR State Defense Committee to the rank of colonel.

A. P. Kazantsev was the first to hypothesize that the Tunguska meteorite was none other than an extraplanetary space ship crashing in the Siberian taiga. Decades has passed since that time, and scientists still debate the writer's bold assertion. Those who want to feel the unusual in a conversation, to peer into the future, come to A. Kazantsev from all over the world--from France and Japan, the USA and Italy, East Germany and Cuba.

Nearly all the writer's works literally begin with new ideas and interesting hypotheses. For example, the Honored Scientist and Technician Professor M. M. Protod'yakonov counted in just one novel, "Sil'neye vremeni" [Stronger Than Time], about 120 discoveries and inventions yet to be made.

Today the internationally famous writer, awarded Soviet and international literary prizes, on the request of our correspondent tells about his creative plans, about the paths of development of science fantasy and the foreseeable future.

"Man alone," says Aleksandr Petrovich, "of all the living creatures inhabiting the earth, can see that which does not exist. It is this capacity that is called imagination, fantasy. It lies at the basis of any creation, be it that of the writer, engineer, architect or physicist. Without fantasy, without creative imagination, neither science nor art would be possible. V. I. Lenin said that even integral and differential calculus is impossible without fantasy. If we look at the history of mankind, we see that all great discoveries or epochal accomplishments were preceded by the Great Dream.

"I myself am by education an engineer, and my route to literature began 40 years ago when I became interested in the dream of Academician A. Ioffe concerning the creation of thin-layer electrical condensers of vast power. Then I was unexpectedly invited to take part in an All-Union conference of science-fantasy films, organized by scientists' clubs in Moscow and Leningrad and by the Mezhrabpomfil'm film studio. Thus there appeared the script to the film "Arenida", which received the highest prize and then provided that basis of the novel 'Pylayushchiy ostrov'.

"I am most proud of the fact that for many decades, when meeting with people in various corners of our nation, I have heard words of gratitude for the creation of 'Pylayushchiy ostrov'. The book helped one person become a physicist; another, an engineer. And recently I was telephoned by a total stranger, the chief of a certain construction bureau, who said: 'I want to make you a gift. Our construction bureau has realized one of the ideas set out in your novel'.

"I have many inventions, not only in literary works but also in real life. For example, work is now proceeding in a number of nations on electrostimulators that assist cardiac function. They now operate from batteries that are depleted in two to three years, and the person requires a repeat operation. Together with Professor I. Grigorov and our comrades-in-arms we obtained six successive certificates for 'perennial' electrostimulators, which do not have to be replaced. They draw energy from the movement of the person himself (as, for example, in self-winding watches).

"As early as 40 years ago I stated the seemingly fantastic idea of a 'steam airplane--a steamplane'. But now it turns out that this may become a reality. Of course technology develops along a dialectical spiral. There is no question that jet liners have great velocities, but they are uneconomical. Therefore, the trend is now for a return to propellers. In contrast to the earlier propellers, these propellers are multibladed, curved and, according to the judgements of specialists, very promising. If the spiral of development is continued further, it can be proposed that the motors will be brought into motion by steam obtained from an atomic power plant. Here is your steamplane-atomplane. I think that it will take off in several decades!

"Fantasy nourishes the activity of every thinking, creative person. Take, for example, such a genius forecaster as Jules Verne. It can be boldly stated that entire generations of scientists and engineers used his ideas.

"The notable Soviet fantasy writer I. Yefremov in the story 'Shadow of the Past' colorfully depicted how a three-dimensional image of a dinosaur suddenly appeared under a particular illumination of the atmosphere. This story was a unique creative stimulus for Corresponding Member of the USSR Academy of Sciences Yu. Denisyuk, who invented a method for holography.

"As is known, I. Yefremov was both a paleontologist and a geologist, who traveled much in Siberia. And in his story 'Diamond Conduit' he stated the hypothesis that there should be diamond deposits in specified places in Siberia. It is extremely interesting that it was there, in Yakutia, that they were found.

"The practical work of Professor S. Byukhonenko on the transplantation and adaptation of organs is an application of ideas stated in the well-known novel by A. Belyayev "Golova professora Douelya" [The Head of Professor Dowell]. And another fantasy writer A. Dolgushin in the novel "Generator chudes" [Generator of Miracles] stated the idea of reanimation even before the war. In a word, a multitude of examples of such predictions can be cited.

"In the 17th century lived an unusual person--Cyrano de Bergerac. In his tract 'L'autre monde' he, in describing a 'trip to the moon' predicted interplanetary flights with the help of multistage rockets in a single package, the condition of weightlessness, the parachute, television, the radio receiver, books in the form of crystals, the existence of microbes and much more that even today is unknown. Bergerac himself said that he received this information from the inhabitants of other worlds. Of course, in his time all this was taken as a joke, but for us it is occasion for thought.

"Man has long dreamed of contact, of meetings with brothers in the mind, to which today symposia and conferences are devoted; the signals of extraterrestrial civilizations are sought for in the ether. But it seems to me that our own planet should not be forgotten in this plane. I met with the Swiss amateur archeologist (E. Deniken), who wrote the book 'Recollections of the Future'. In South America and other places he gathered evidence of the fact that our earth in the ancient past was visited by strangers from the stars. His evidence is not always indisputable and precise. But the seven international congresses on this question say a great deal.

"Quite a few strange facts have now been accumulated, for which only one most likely explanation is possible: yes, extraterrestrials have already visited the earth.

Many peoples have, for example, legends about 'children of the sky' descending to them five and six thousand years ago and about their contact with

humans. No one, for example, can explain why the 'wild' Sumerians suddenly found the highest civilization. A cuneiform explains this by the appearance near Babylon of a mysterious being that taught the people writing, laws and art. It explained how to build a house, gave the elements of geometry and showed how seeds must be distinguished and fruit gathered and how to irrigate the land.

"The ancient Aztecs, Mayans and Incas had something similar. There also 'children of the Sun' taught them handicrafts, transmitted knowledge and flew away after promising to return. The 'ignorant' Dogon in Africa have transmitted from generation to generation 'secret knowledge', transmitted to them by people from Sirius. Our scientists have gained this knowledge only in the 20th century. Legends about strangers were transmitted from generation to generation in India, in Japan, and in China. It was believed in Ancient Egypt that Thoth, the god of wisdom, arrived from Sirius.

"The French investigator Henri Lhote found stone images more than five thousand years old on cliffs in the Sahara (Tassili). In them we see figures in helmets and protective suits. Several even have something similar to antennae. And thousands of kilometers away, in Japan, identical sculptured images were found. All features of a modern space suit were reproduced on them in great detail: the hermetic helmet, slitlike apertures, clasps, hatches for inspection of the helmet and even filters for breathing. I am keeping such figures sent to me as a gift by way of the Soviet embassy in Tokyo.

"In Salvador a vase was found with an image of humanoid beings in a flying rocket. In a Colombian bank is kept a gold model of a jet airplane made more than one thousand years ago. Recently in the desert of (Nask) on a high-mountain plateau during an aerial mapping strange signs and stone roads 'going nowhere' were found. Many of them are very similar to landing strips. Perhaps extraplanetary machines once accelerated down them?

"Scattered over the earth is a multitude of surprising, still unexplained monuments. In Costa Rica, for example, spheres of an ideal form of from two meters to the size of a multistory house were scattered in forests and swamps. No one can explain the method for their preparation and their purpose. The Vaal'bek Veranda is made up of three vast stones, each weighing two thousand tons. Even with modern technological methods it is impossible to raise such masses onto the hill from the quarry, where one of the slabs remains.

"Judging by the ancient legends, traditions and manuscripts, the strangers left after promising to return. Before this they not only enriched with knowledge the ancient peoples of the earth but also warned the people of something. Thus, in the Sanskrit language along with a description of a flying chariot of fire, the ancient Indian source (the Mahabharata epic) tells of a terrible battle with the use of a nuclear weapon. Identical descriptions of unknown wars with the use of a monstrously destructive weapon are present in the peoples of South America and Celtic mythology-- everywhere where there could have been contacts with stellar strangers.

These are bases for concluding that thousands and thousands of years ago extraterrestrials forewarned people concerning the fatal consequences of using the 'ultimate weapon'.

"It should not be thought that fantasy literature is only the prediction of scientific discoveries, new machines and apparatus. The basis of Aleksey Tolstoy's novel "Giperboloid inzhenera Garina" [Engineer Garin's Hyperboloid] was by no means the idea of thermal 'death rays', but the prediction of Fascism. He himself told me this during our conversations. The same refers to "Aelita". Here are shown no Martian wonders but, along with the poetry of Aelita's love, the social contradictions and the class struggle on the 'red planet'.

"The authenticity of the improbable--this is the main principle of artistic fantasy. Therefore, you will not find fairytale motifs in my works. Of course a story does not require factual support. Science fantasy is primarily literature. And it is not so much about ideas as about the bearers of these ideas, that is to say about people. If one penetrates the psychology of heroes and learns to understand people and their interconnections and relationships, this makes it possible to guess trends in the development of science, while prognoses later prove to be correct. And the best reward for the writer is the recognition by the readers of the fact that his fantastic ideas and prognoses have been borne out by life.

"In my time I met the famous physicist Niels Bohr. He told me that 'crazy ideas' are needed for the development of science. There are periods when it seems that science has explained everything, that there are no roads further, a dead end. And then here comes Einstein with the theory of relativity. Approximately the same thing is observed now. Very many facts have been accumulated, which must be united into a single physical theory.

"With what shall science concern itself during the new, the 21st century? Until now we have created increasingly improved machines. Now, I think, it is time to be concerned with man's cognition, has abilities and talent. For all nature's secrets the greatest is man. And the greatest treasure is also man. Our organism possesses many still incompletely understood possibilities. Long years will not quiet the debates concerning telepathy, telekinesis, clairvoyance, biopoles and so on. What is truth here, what is imagination? Here is an example for you.

"Not so long ago by my initiative N. Kulagina, a woman from Leningrad, appeared in the presence of several scores of scientists and journalists. Those present were convinced that she undoubtedly possesses an ability to evoke telekinesis. Various objects were placed under a plastic cup: a matchbox, fountain pen and magnetic compass. N. Kulagina forced the arrow of the compass to rotate with great speed and moved the objects under the cap."

"N. Kulagina can do much more than modern science can yet explain. She was tested by six academicians. And, not having found any tricks or charlatanism, N. Kulagina was taken to the Control Problems Institute (Automation and Telemechanics) of the USSR Academy of Sciences for further study of her unique abilities. It should be stated in recent time increasing numbers of serious scientists no longer scoff at these problems but are coming to the conclusion that 'there is something there', that not everything is tricks and deception."

"Fantasy as a part of literature influences not only the development of science and technology but first of all the development of the man of the communist future. Our Soviet fantasy writers calls ahead, to the harmonious improvement of people. I believe that in the new century reason will conquer--and the human race, free from wars and ignorance, from hunger and diseases, will begin a qualitatively new turn in its history."

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August 2, 1983